COMPLIMENTARY COPY
Please Credit Ontario Hydro Research if
Reproduced in Whole or in Part.

ontario hydro
research division

To Mr. D.K.A. Gillies
Manager, Environmental Protection
Technical & Training Services Division

# ACID RAIN STUDIES:
# ACID PRECIPITATION DATA BASE

T. Jarv
Chemist
Atmospheric Research Section

## ABSTRACT

A data set consisting of annual average acid precipitation chemistry data collected at field sites across eastern North America has been assembled for the years 1978 to 1982. This information is to be used for assessing precipitation chemistry trends and for use in testing long-range transport (LRT) models being used by Ontario Hydro to calculate its contribution to acidic deposition in Ontario and neighbouring regions. The following monitoring networks contributed to the data set: Canada - APN, APIOS, CANSAP and Ontario Hydro and United States - MAP3S, UAPSP, EPRI/SURE and NADP. Procedures recommended by the Canadian Federal-Provincial Research and Monitoring Coordinating Committee's Atmospheric Science Sub-group (RMCC/ASSG) were used to screen the field data to provide the unified data base. The data base presented in this report includes: annual average precipitation-weighted pH values and $SO_4^=$, $NO_3^-$ and $H^+$ concentrations in precipitation; total depth of the precipitation; and total annual wet acidic deposition of $SO_4^=$, $NO_3^-$ and $H^+$ for 1978 to 1982. As well, annual average concentrations of $SO_2$, $SO_4^=$, $HNO_3$ and total $NO_3^-$ in air are given for the years 1979 to 1982.

| job | file | date | report no. |
|---|---|---|---|
| 740635-101-591 | 837.233 | November 29, 1984 | 84-404-K |

## 1.0 INTRODUCTION

Ontario Hydro, through the use of coal-fired thermal generating stations, is a contributor to emissions that are precursors of acid rain. The statistical long-range transport model developed by Fisher/1,2/ has been adapted to eastern North America/3/ to allow Ontario Hydro to assess its contribution to acidic deposition in environmentally sensitive areas in and around Ontario. To evaluate the results provided by the Fisher LRT model, air and precipitation chemistry data collected at field sites across eastern North America are needed. This information is available from the various precipitation monitoring networks that operate in eastern North America. However, each network employs different screening and calculation procedures to report the results.

Recently, the Canadian Federal-Provincial Research and Monitoring Coordinating Committee's Atmospheric Sciences Sub-group (RMCC/ASSG) requested that a small group of deposition monitoring and mathematical modelling scientists develop the necessary data screening and wet deposition calculation procedures to provide a unified and up-to-date wet deposition data set for eastern North America. These procedures were obtained from the Committee and used to assemble an acid rain data base to support and test the Fisher model calculations at Ontario Hydro. This brief report documents the contents of the data base.

The acid precipitation data base includes: annual average concentrations of $SO_2$, $SO_4^{=}$, $HNO_3$ and total $NO_3^{-}$ in air; annual average precipitation-weighted pH values and $H^+$, $SO_4^{=}$ and $NO_3^{-}$ concentrations in precipitation; total depth of precipitation; and total wet acidic deposition of $H^+$, $SO_4^{=}$ and $NO_3^{-}$.

The annual average concentrations and total precipitation were abstracted from data reports obtained from the following: Ontario Hydro daily air and precipitation network, Ontario Ministry of the Environment daily air and precipitation and 28-day cumulative precipitation APIOS networks, Environment Canada - Atmospheric Environment Service APN daily air and precipitation and CANSAP monthly cumulative precipitation networks, the US Department of Energy MAP3S event type precipitation network, the US National Atmospheric Deposition Program (NADP) weekly cumulative precipitation network, and the Utility Acid Precipitation Study Program (UAPSP) daily precipitation monitoring network/4 to 26/.

The screening criteria outlined in Appendix A were used to compose the acid precipitation data base. The wet deposition values listed in the data base were obtained in part from the Acidic Deposition System (ADS) being compiled at Battelle Pacific Northwest Laboratories/27/.

The precipitation-weighted component concentrations and depositions are described in Section 2.0 and are listed in Appendix B. The air concentrations are described in Section 3.0 and are listed in Appendix C. Concluding remarks are presented in Section 4.0.

## 2.0 ANNUAL PRECIPITATION-WEIGHTED CONCENTRATIONS AND DEPOSITIONS

The annual precipitation-weighted concentrations and depositions are listed in Tables B1 to B15 of Appendix B. The available site locations for each network are presented in each Figure preceding the individual network results. The precipitation-weighted concentrations are given as milligrams per liter (mg/L), the total precipitation depth as centimeters (cm) and the precipitation-weighted deposition as grams per square meter per year ($g/m^2/a$). The results are organized by agency/network and then by year. The Canadian networks: APN, CANSAP, APIOS and Ontario Hydro are presented first followed by the US networks: MAP3S, EPRI/SURE, UAPSP and NADP. The numbers of sites with annual averages available for each of the above-mentioned parameters are summarized in Table I. Conversion factors for the above units to other commonly used units are presented in Table II.

The selection rules for screening the annual averages listed in Appendix B are described in detail in Appendix A. Only sites conforming to level 1 or 2 data quality criteria, as presented in Tables A1 to A3, were used to compile the data base.

## 3.0 ANNUAL AVERAGE AIR CONCENTRATIONS

Annual average concentrations, in micrograms per cubic meter ($\mu g/m^3$), for $SO_2$, $SO_4^=$, $HNO_3$ and total $NO_3^-$ in air are listed in Tables C1 to C3 for the Ontario Hydro, Ontario Ministry of the Environment and Atmospheric Environment Service networks, respectively. The air monitoring site locations are displayed in Appendix B in Figures B1, B3 and B5.

The selection rules for the data screening and compatibility of the air sample analysis results were determined at Ontario Hydro. Each site must have operated for at least 9 months of the calendar year with at least one month of sampling in each season and at least 12 days of sampling in each operational month. Below detection limit results were set at one-half the detection limit, identical to the method used by the OME/25/, and then incorporated into the annual average.

## 4.0 CONCLUDING REMARKS

The annual concentrations and depositions presented in this report have been brought together from different networks through a common set of screening criteria. The years 1980 to 1982 provide the most comprehensive coverage of eastern North America for both air and precipitation annual averages.

The results listed in Appendices B and C will be used to evaluate LRT models that predict annual concentrations. Trend analysis on the precipitation chemistry data will also be performed to assess the "real" deposition occurring in sensitive areas.

TABLE I

Number of Field Sampling Sites with Annual Averages Available in Each Calendar Year Listed by Network and Sampling Type

| Network | Type of Sampling (collection period) | Calendar Year 1978 | 1979 | 1980 | 1981 | 1982 |
|---|---|---|---|---|---|---|
| Canadian | | | | | | |
| Ontario Hydro | Air (daily) | - | - | 5 | 2 | 4 |
| | Pptn* (daily) | 4 | 5 | 4 | 3 | 6 |
| OME-APIOS | Air (daily) | - | - | - | 3 | 4 |
| | Pptn (daily) | - | - | - | 12 | 15 |
| | Pptn (monthly) | - | - | - | 30 | 33 |
| AES-APN | Air (daily) | - | 4 | 3 | 4 | 6 |
| | Pptn (daily) | - | 3 | 4 | 5 | 6 |
| AES-CANSAP | Pptn (monthly) | 13 | 11 | 22 | 27 | 23 |
| United States | | | | | | |
| MAP3S | Pptn (event) | - | - | 8 | 9 | 9 |
| EPRI-SURE | Pptn (daily) | - | 9 | 9 | 5 | - |
| UAPSP | Pptn (daily) | - | - | - | - | 17 |
| NADP | Pptn (weekly) | - | - | 26 | 50 | 60 |
| Total Air Monitoring Sites: | | - | 4 | 8 | 9 | 14 |
| Total Pptn Monitoring Sites: | | 17 | 28 | 73 | 141 | 169 |

* Pptn = precipitation

## TABLE II

### Concentration and Deposition Conversion Factors

| Multiply | by | To obtain |
|---|---|---|
| grams per square meter per year | 10 | kilograms per hectare per year |
| milligrams per liter of sulfate ion ($SO_4^{=}$) | $\frac{\text{ion charge no.}}{\text{molecular weight}}$ $\frac{(2)}{(96)}$ | milliequivalents per liter of sulfate ion |
| milligrams per liter of nitrate ion ($NO_3^{-}$) | $\frac{\text{ion charge no.}}{\text{molecular weight}}$ $\frac{(1)}{(62)}$ | milliequivalents per liter of nitrate ion |
| milligrams per liter of hydrogen ion ($H^{+}$) | $\frac{\text{ion charge no.}}{\text{molecular weight}}$ $\frac{(1)}{(1)}$ | milliequivalents per liter of hydrogen ion |

The data base described in this report contains data up to the end of 1982. Acid precipitation analysis data are continually being generated by the various monitoring agencies operating in eastern North America. It is recommended that the above data base be kept up to date.

An expansion of the above data base is required to undertake studies such as the monthly/seasonal fluctuations in the sulfate to nitrate ratio, seasonal loading variations of species such as $NH_4^+$, $Mg^{2+}$, $Ca^{2+}$, and $Na^+$ and finer time average concentration or deposition estimates with LRT models. The annual averages data base described above contains approximately 3500 entries. A monthly/seasonal data base would be expected to contain at least 17,000 entries for the same parameters and years used above. Compiling a seasonal data base containing data for additional species (ie, $NH_4^+$, $Ca^{2+}$, $Mg^{2+}$, etc) is an enormous task at this time as the data would have to be screened manually. It is suggested that information from 1980 onwards be considered. This would allow the ADS data base, developed and maintained at Battelle Pacific Northwest Laboratories/27/ (available at Research Division) and their sliding seasonal averaging program currently under development, to be used to help create a seasonal data base at Ontario Hydro.

Approved:

for O.A. Kupcis
Manager
Chemical Research Department

TJ/mf

Prepared by:

T. Jarv
Chemist
Atmospheric Research Section

Reviewed by:

O.T. Melo
Supervising Engineer
Atmospheric Research Section

REFERENCES


1. Fisher, B.E.A.(1975). "The Long-Range Transport of Sulfur Dioxide," Atmos Environ 9, 1063.

2. Fisher, B.E.A. (1978). "The Calculation of Long Term Sulfur Deposition in Europe," Atmos Environ 12, 489.

3. Wright, S.C., J.E. Grabenstetter and J.D. Holdsworth (1984). "Ontario Hydro's Application of Fisher's Statistical Long-Range Transport Model," JAPCA 77th Meeting, June 24-29, 1984, San Francisco, CA.

4. Barrie, L.A., H.A. Wiebe, P. Fellin and K. Anlauf (1980). "APN - The Canadian Air and Precipitation Monitoring Network: A Description and Results for November, 1978 to June, 1979," Environment Canada - Atmospheric Environment Service Report AQRB-80-002-T.

5. Barrie, L.A., H.A. Wiebe, P. Fellin and K. Anlauf (1981). "Results of the Canadian Air and Precipitation Monitoring Network APN: July, 1979 to June, 1980," Environment Canada - Atmospheric Environment Service Report AQRB-81-026-T.

6. Barrie, L.A., H.A. Wiebe, K. Anlauf and P. Fellin,(1982). "Results of the Canadian Air and Precipitation Monitoring Network APN: July, 1980 to December, 1981," Environment Canada - Atmospheric Environment Service Report AQRB-82-009-T.

7. Barrie, L.A., H.A. Wiebe and K. Anlauf (1984). "Results of the Canadian Air and Precipitation Monitoring Network APN: 1982", Environment Canada - Atmospheric Environment Service Report AQRB-84-005-T.

8. Barrie, L.A., and A. Sirois (1982). "An Analysis and Assessment of Precipitation Chemistry Measurements Made by CANSAP (The Canadian Network for Sampling Precipitation): 1977-1980", Environment Canada - Atmospheric Environment Service Report AQRB-82-003-T.

9. Sirois, A. (1983). "The Canadian Network for Sampling Precipitation (CANSAP) Annual Report," Environment Canada - Atmospheric Environment Service Report.

10. "CANSAP Data Summary - 1982," (1983). Environment Canada - Atmospheric Environment Service Report UDC:551.578.8.

11. "UAPSP Precipitation Data Displays for January 1, 1979 - June 30, 1982, Volume 1 and 2" (1983). Prepared by Electric Power Research Institute and Rockwell International for the Utility Acid Precipitation Study Program UAPSP 103, Research Project U101-1, Interim Report.

12. "National Atmospheric Deposition Program (NADP) Report: Precipitation Chemistry - Quarterly Reports (A total of 12)", (1980 to 1982), prepared by Natural Resource Ecology Laboratory, Colorado State University.

13. "The MAP3S Precipitation Chemistry Network: Second Periodic Summary Report (July, 1977 - June, 1978)" (1979), prepared by Pacific Northwest Laboratory for the US Department of Energy.

14. "The MAP3S Precipitation Chemistry Network: Third Periodic Summary Report (July, 1978 - December, 1979)", (1980), prepared by Pacific Northwest Laboratory for the US Environmental Protection Agency through the US Department of Energy Contract DE-AC06-76RLO, 1830.

15. "The MAP3S Precipitation Chemistry Network: Fourth Periodic Summary Report (1980)", (1981), prepared by Pacific Northwest Laboratory for the US Environmental Protection Agency through the US Department of Energy Contract DE-AC06-76RLO, 1830.

16. Dana, M.T. and J.E. Rothert, (1983). "The MAP3S Precipitation Chemistry Network: Fifth Periodic Summary Report (1981)", prepared by Pacific Northwest Laboratories for the US EPA through the US Department of Energy Contract DE-AC06-76RLO, 1830.

17. Rothmert, J.E. and M.T. Dana, (1983). "The MAP3S Precipitation Chemistry Network: Sixth Periodic Summary Report (1982)", prepared by Pacific Northwest Laboratories for the US EPA through the US Department of Energy Contract DE-AC06-76RLO, 1830.

18. Jarv, T. (1982). "Aerosol and Precipitation Chemistry Survey 1977 to 1979 Results," Ontario Hydro Research Division Report 81-230-K.

19. Handy, B. (1981). "Ontario Hydro's Air and Precipitation Monitoring Network - Data Report for January - June, 1980," Ontario Hydro Research Division Report C81-16-K.

20. Handy, B. (1981). "Ontario Hydro's Air and Precipitation Monitoring Network - Data Report for July - August, 1980), Ontario Hydro Research Division Report C81-46-K.

21. Handy, B. (1981). "Ontario Hydro's Air and Precipitation Monitoring Network - Data Report for September - December, 1980," Ontario Hydro Research Division Report C81-113-K.

22. Jarv, T. (1982). "Acid Rain Studies at Ontario Hydro: Air, Aerosol and Precipitation Chemistry Measurements for 1981," Ontario Hydro Research Division Report C82-81-K.

23. Handy, B. (1984). "Acid Rain Studies at Ontario Hydro: Air and Precipitation Chemistry Measurements for the Period January, 1982 to May, 1983," Ontario Hydro Research Division Report C84-23-K.

24. Chan, W.H., A.J.S. Tang and M.A. Lusis (1983). "Precipitation Concentration and Wet Deposition Fields of Pollutants in Ontario, September, 1980 to December, 1981," Ontario Ministry of the Environment Report ARB-61-83-ARSP.

25. Kirk, R.W., (1983). "Annual Statistics of Concentration Daily Ambient Air Monitoring Network, 1981," Ontario Ministry of the Environment Report ARB-114-83-ARSP, APIOS-009/83.

26. Kirk, R.W. and W.H. Chan, (1983). "1981 Summary Statistics of Observed Concentration and Deposition Daily Precipitation Monitoring Network," Ontario Ministry of the Environment Report ARB-86-83-ARSP.

27. Watson, C.R. and A.R. Olsen (1984). "Acid Deposition System (ADS) for Statistical Reporting - System Design and User's Code Manual," US Environmental Protection Agency Report EPA-600/8-84-023.

## APPENDIX A

## PROPOSED DATA SCREENING AND DEPOSITION CALCULATION PROCEDURES FOR EASTERN NORTH AMERICAN PRECIPITATION CHEMISTRY DATA BASE*

* Prepared by the Canadian Federal-Provincial Research and Monitoring Coordinating Committee's Atmospheric Sciences Sub-Group (RMCC/ASSG).

## A1. INTRODUCTORY NOTES

A1.1 The data set generated here will be primarily of interest to mathematical modellers. However, it will undoubtedly also be of value for effects assessment.

A1.2 The objective is to produce concentration and deposition information on an annual and seasonal basis. In addition to average values (and also annual totals for deposition), certain statistics will also be computed. These are: maximum and minimum values; means (arithmetic and geometric); the 25, 50 and 75 percentiles; and the Kolomogorov-Smirnov D-statistic (to test the distribution of the data).

A1.3 Although ultimately a unified data set on all the major ions is of interest, top priority will at present be given to sulfates and nitrates. For this reason, the proposed data screening criteria in Tables A1 to A3 do not have any requirements on the sample ionic balance (there are often insufficient data to form a complete ionic balance, while at the same time, we have reasonable confidence in laboratory analysis methods for the above two ions). For ions such as hydrogen, however, it may be necessary to include an ionic balance requirement, similar to that outlined in Table A4, among the data screening criteria.

A1.4 Not all data are of the same quality, because of different sample capture efficiencies on an annual, seasonal and individual sampling period basis, different degrees to which "ideal" siting criteria are satisfied at each site, etc. For users of the data, it would be very valuable to distinguish between sites yielding data of different quality. We are therefore proposing three levels of data quality, "level 1" data having to meet the most rigorous screening criteria. The data for each site will be accompanied by the estimated level of data quality. Eventually, it is hoped that accuracy values can also be developed for each of the three levels, although at present this information is not available.

A1.5 In addition to the data screening criteria outlined in Tables A1 to A3, additional information provided by sample coding for each contributing network (eg., obvious contamination of a particular sample) will also be considered in generating of the data set, and assigning the levels of data quality. The interpretation of these codes, and the decision on whether or not to include a particular datum value, will be left to the central database manager (and documented by him).

A1.6 It is recommended that the ADS Database at Battelle Pacific Northwest Laboratories be used for generating the unified deposition data sets of interest here. This means that at present, the data will come primarily from the following networks: in the USA - NADP, MAP3S, EPRI/SURE, and UAPSP; and in Canada - CANSAP, CAPMON, APN and APIOS.

## A2. CONCENTRATION AND DEPOSITION CALCULATION PROCEDURES

A2.1 All seasonal/annual concentrations will be volume-weighted average values, using the volume measured during the collection period by a co-located standard gauge, or the collector itself (whichever is the greater during each individual collection period).

A2.2 All seasonal/annual deposition values will be calculated by multiplying the volume-weighted average concentration by the total precipitation depth. The total depth will be determined by summing the standard gauge depth or the collector depth (whichever is greater during each collection period) values over the season/year.

A2.3 Often data will be missing from one or more collection periods. In this case the annual/seasonal deposition should be calculated by multiplying the average volume-weighted concentration during the year/season, and the estimated total precipitation depth during the year/season (determined from the standard gauge or the collector depth during each collection period, whichever is the greater).

A2.4 The precipitation depth data should be collected at the precipitation chemistry monitoring site. However, if depth data are missing from both standard gauge and collector for a particular sampling period, then information from the nearest weather service station may be substituted, provided that the station is judged to be representative of the precipitation chemistry monitoring station.

A2.5 A problem is introduced by the fact that different networks use different collection periods (event or daily, as in MAP3S, SURE, UAPSP, APN and APIOS - event; weekly, as in NADP; 28-day as in APIOS - cumulative; and monthly, as in CANSAP). Therefore, data from certain networks (e.g. NADP, APIOS - cumulative) may straddle the climatological seasons, defined here as follows: winter - December, January, February, (contiguous); spring - March, April, May; summer - June, July, August; fall - September, October, November. (Note that by the annual period we mean the calendar year.) We have elected not to split numerically APIOS - cumulative samples which straddle several months, and to calculate two data sets for seasonal concentration and

deposition, viz.: (i) one which gives the maximum spatial coverage, and includes all networks mentioned in A1.6, with the exception of APIOS/cumulative (some of the NADP samples will have to be apportioned between seasons but this is a minor problem); and (ii) one which gives the optimum number of data, and includes all the networks mentioned in A1.6 with the exception of CANSAP (note that the collection of APIOS-cumulative samples is in phase with the collection of NADP samples). In the latter case the "seasons" will be selected to be as close as possible to the climatological seasons as defined above, and may vary somewhat from year to year. On an annual basis, the apportionment of samples to adjacent years should not be a problem. Sample apportionment should be done using information on concentration during the period of interest, and precipitation depth, obtained either at the sampling site, or if unavailable, at a nearby weather station (if deemed to be representative). If (in rare cases) apportionment based on depth is not possible, then the apportionment should be based on time. After inspection of the seasonal data sets (i) and (ii) above, it may be possible to simplify the presentation of the seasonal data, if both procedures give comparable results.

## A3. DATA PRESENTATION FORMAT

A3.1 The data will be presented in tabular form, listing, by station, the annual/seasonal concentration and deposition values, precipitation amounts, collection efficiency, the appropriate level of data quality and other data quality information, the sample statistics (seasonal and annual for event/daily stations; annual only for weekly, 28-day and monthly stations), and other comments where appropriate (e.g. where some data are missing, the particular collection period missing, and per cent data missing during the averaging period will be given).

A3.2 The data will also be presented on a map, showing annual/seasonal values beside each monitoring station, together with the precipitation depth and level of data quality.

A3.3 At present, no contour maps of concentration/deposition will be produced. A number of alternative methods are being looked at by different groups, each giving somewhat different results, and it is not clear which one is best. For purposes of model validation, it is felt that values at individual measurement sites will be adequate. (For effects assessment, contour maps may be more useful. In this case the ADS database can produce its own version of the contour maps, on special request.)

## A4. DATA SCREENING CRITERIA

A4.1 The data screening criteria proposed here for sulfate and nitrate concentration and deposition are given in Tables A1 to A3. For ions such as hydrogen an ion balance criterion will also probably have to be applied (Table A4). Although Tables A1 to A3 are based primarily on data representativeness and completeness considerations, a careful examination of outliers and available data quality codes will also be included in the screening procedure. The exact steps to be followed in the evaluation of outliers are still to be finalized.

A4.2 It is proposed that only data from wet-only (as opposed to bulk) collectors be considered.

A4.3 It is proposed that the siting of each station be evaluated as good, fair or bad using the broad definitions given by R. Vet (see MOI Report No. 2F - M, and Concord Scientific Report 110-84, "A Comprehensive Evaluation and Integration of Selected Wet Deposition Data from Canada and the USA"). According to this classification: (i) a good site is one which can be assumed to be regionally representative with very limited local effects; (ii) a fair site is one which can be assumed to be regionally representative but with greater uncertainty because of possible or expected (relatively small) local influences; (iii) a bad site is one which is not judged to be regionally representative due to known local influences (emissions, dusty surroundings, etc.). The comments of the individual network operators, or where possible, the results of site audits, will be sought when classifying sites.

A4.4 The seasalt correction should be applied to data from sites within 50 km of the coast. The exact correction procedure to be used is still to be finalized.

A4.5 The overall collector efficiency referred to in Tables A1 to A3 is a measure of how much of the total sample during the season/year was captured. It is here defined as the sum of the sampler depths (during each collection period) over the season/year, divided by the sum of the standard gauge depths (if, during a particular period, the sampler depth is greater than the gauge depth, then the former should be used instead of the latter).

A4.6 The overall collector efficiency requirement for winter data has been relaxed somewhat compared to other seasons because of the generally poorer collector performance during winter. It was felt that if the 75% requirement for other seasons (level 1) were also applied to the winter months, the data loss would be too large. On the other hand, a lower percentage could be accepted for winter because the problems are primarily due to undercatch rather than sampler malfunction, so the sample collected is expected to be reasonably representative.

A4.7 In order that a sample from a particular period be included among the "number of samples" in Tables A1, A2 and A3 (criterion (4)), the collector efficiency for that sample, compared to a standard gauge, should be at least equal to the "overall collector efficiency" (criterion (3)). An exception is that for the annual calculation, the winter criterion (40%) should be applied to the winter months.

TABLE A1

DATA SCREENING CRITERIA FOR ANNUAL CONCENTRATION/DEPOSITION

| Criterion | Level 1 | Level 2 | Level 3 |
|---|---|---|---|
| (1) Siting | Good or Fair | Good or Fair | Good, Fair or Bad |
| (2) Seasalt Correction | $\leq$20% | $\leq$40% | $\leq$40% |
| (3) Overall Collector Efficiency | $\geq$60% | $\geq$50% | $\geq$40% |
| (4) No. of Samples | | | |
| - monthly/28-day | $\geq$40+ | $\geq$10+ | $\geq$8+ |
| - weekly | $\geq$40+ | $\geq$40+ | $\geq$34+ |
| - daily/event | $\geq$80%* | $\geq$80%* | $\geq$60%* |
| (5) No. of Samples During Each Season | | | |
| - monthly/28-day | $\geq$2 | $\geq$2 | $\geq$1 |
| - weekly | $\geq$10 | $\geq$10 | $\geq$4 |
| - daily/event | $\geq$60%* | $\geq$60%* | $\geq$40%* |

* Based on total number of events, as determined from co-located standard gauge

+ Dry collection periods are also included in this number

TABLE A2

DATA SCREENING CRITERIA FOR WINTER SEASON

| Criterion | Level 1 | Level 2 | Level 3 |
|---|---|---|---|
| (1) Siting | Good or Fair | Good or Fair | Good, Fair or Bad |
| (2) Seasalt Correction | $\leq$20% | $\leq$40% | $\leq$40% |
| (3) Overall Collector Efficiency | $\geq$40% | $\geq$20% | $\geq$20% |
| (4) No. of Samples | | | |
| - monthly/28-day | $\geq$2+ | $\geq$2+ | $\geq$1+ |
| - weekly | $\geq$10+ | $\geq$10+ | $\geq$4+ |
| - daily/event | $\geq$60%* | $\geq$60%* | $\geq$40%* |

* Based on total number of events, as determined from co-located standard gauge

+ Dry collection periods are also included in this number

TABLE A3

DATA SCREENING CRITERIA FOR SPRING, SUMMER AND FALL

| Criterion | Level 1 | Level 2 | Level 3 |
|---|---|---|---|
| (1) Siting | Good or Fair | Good or Fair | Good, Fair or Bad |
| (2) Seasalt Correction | $\leq$20% | $\leq$40% | $\leq$40% |
| (3) Overall Collector Efficiency | $\geq$75% | $\geq$50% | $\geq$40% |
| (4) No. of Samples | | | |
| - monthly/28-day | $\geq$2+ | $\geq$2+ | $\geq$1+ |
| - weekly | $\geq$10+ | $\geq$10+ | $\geq$4+ |
| - daily/event | $\geq$60%* | $\geq$60%* | $\geq$40%* |

* Based on total number of events, as determined from co-located standard gauge

+ Dry collection periods are also included in this number

TABLE A4

ION BALANCE DATA SCREENING CRITERIA*

| Σ(Cation + Anion) ueq/l | $\frac{\Sigma Cat - \Sigma An}{1/2\ (\Sigma Cat + \Sigma An)}$ |
|---|---|
| 0 - 50 | - |
| 50 - 75 | ±50% |
| 76 - 100 | ±30% |
| 100 | ±15% |

* Must be met by Level 1 and 2 data, for ions such as $H^+$

## APPENDIX B

## ANNUAL PRECIPITATION - WEIGHTED AVERAGE CONCENTRATIONS AND DEPOSITIONS FOR $SO_4^=$, $NO_3^-$ and $H^+$ FOR EASTERN NORTH AMERICA

FIGURE B1

Details and Locations of AES-APN Monitoring Sites

| Site No | Name | Location Longitude | Location Latitude | Elev. (m) |
|---|---|---|---|---|
| 1 | Experimental Lakes Area - Kenora | 93° 43' | 49° 40' | 368 |
| 2 | Chalk River | 77° 24' | 46° 04' | 122 |
| 3 | Long Point | 80° 30' | 42° 36' | 175 |
| 4 | Kejimkujik National Park | 65° 12' | 44° 26' | 152 |
| 5 | Algoma | 84° 06' | 47° 06' | n/a |
| 6 | Montmorency Forest | 71° 09' | 47° 19' | 640 |
| 7 | Longwoods | 81° 29' | 42° 53' | 239 |

TABLE B1

ATMOSPHERIC ENVIRONMENT SERVICE - APN DAILY MONITORING
NETWORK ANNUAL AVERAGE CONCENTRATIONS AND DEPOSITIONS FOR 1979 TO 1982

| Site Name | PPTN (cm) | pH | Concentrations (mg/L) | | | Depositions ($g/m^2/a$) | | |
|---|---|---|---|---|---|---|---|---|
| | | | $SO_4^=$ | $NO_3^-$ | $H^+$ | $SO_4^=$ | $NO_3^-$ | $H^+$ |
| **1982** | | | | | | | | |
| ELA-Kenora | 69.0 | 4.75 | 1.56 | 1.07 | 0.018 | 1.07 | 0.74 | 0.012 |
| Algoma | 165.5 | 4.42 | 2.12 | 1.41 | 0.038 | 3.51 | 2.33 | 0.062 |
| Chalk River | 82.6 | 4.23 | 2.91 | 1.92 | 0.058 | 2.40 | 1.58 | 0.048 |
| Long Point | 83.0 | 4.07 | 5.99 | 3.43 | 0.085 | 4.97 | 2.85 | 0.070 |
| Montmorency Forest | 123.6 | 4.40 | 1.71 | 1.15 | 0.040 | 2.11 | 1.43 | 0.049 |
| Kejimkujik | 126.2 | 4.56 | 1.36 | 0.63 | 0.027 | 1.72 | 0.79 | 0.035 |
| **1981** | | | | | | | | |
| ELA-Kenora | 58.4 | 4.98 | 1.16 | 0.87 | 0.010 | 0.68 | 0.51 | 0.006 |
| Algoma | 175.0 | 4.25 | 3.66 | 2.46 | 0.056 | 6.40 | 4.31 | 0.098 |
| Chalk River | 90.8 | 4.30 | 3.29 | 2.14 | 0.049 | 2.99 | 1.94 | 0.045 |
| Long Point | 84.9 | 4.08 | 4.72 | 3.39 | 0.083 | 3.97 | 2.85 | 0.070 |
| Kejimkujik | 162.2 | 4.59 | 1.36 | 0.63 | 0.025 | 2.21 | 1.03 | 0.041 |
| **1980** | | | | | | | | |
| ELA-Kenora | 51.7 | 4.89 | 1.01 | 0.88 | 0.013 | 0.52 | 0.46 | 0.007 |
| Chalk River | 95.5 | 4.33 | 2.82 | 1.91 | 0.046 | 2.69 | 1.83 | 0.044 |
| Long Point | 86.5 | 4.13 | 4.01 | 2.92 | 0.073 | 3.47 | 2.52 | 0.063 |
| Kejimkujik | 117.0 | 4.44 | 1.76 | 0.87 | 0.036 | 2.06 | 1.02 | 0.042 |
| **1979** | | | | | | | | |
| ELA-Kenora | 49.3 | 5.14 | 1.9 | 1.41 | 0.007 | 0.94 | 0.70 | 0.0035 |
| Chalk River | 83.4 | 4.40 | 3.8 | 2.47 | 0.040 | 3.2 | 2.06 | 0.033 |
| Long Point | 88.3 | 4.33 | 4.7 | 3.02 | 0.047 | 4.2 | 2.67 | 0.042 |

FIGURE B2

Details and Locations for CANSAP Monitoring Sites

| Site Name | Location Longitude | Latitude | Elev. (m) |
|---|---|---|---|
| Churchill, Man. | 94° 04' | 58° 45' | 30 |
| Bissett, Man. | 95° 40' | 51° 02' | 259 |
| Trout Lake, Ont. | 89° 52' | 53° 50' | 221 |
| Moosonee, Ont. | 80° 39' | 51° 16' | 11 |
| Pickle Lake, Ont. | 90° 12' | 51° 28' | 370 |
| ELA, Ont. | 93° 43' | 49° 40' | 369 |
| Kapuskasing, Ont. | 82° 26' | 49° 24' | 228 |
| Atikokan, Ont. | 91° 37' | 48° 45' | 394 |
| Dorset, Ont. | 78° 56' | 45° 13' | 320 |
| Kingston, Ont. | 76° 36' | 44° 13' | 93 |
| Peterborough, Ont. | 78° 21' | 44° 14' | 192 |
| Mount Forest, Ont. | 80° 45' | 43° 59' | 416 |
| Simcoe, Ont. | 80° 16' | 42° 51' | 242 |
| Harrow, Ont. | 82° 54' | 42° 02' | 192 |
| Fort Chimo, Que. | 68° 25' | 58° 06' | 37 |
| Nitchequon, Que. | 70° 54' | 53° 12' | 550 |
| Sept Isles, Que. | 66° 15' | 50° 13' | 56 |
| Chibougamau, Que. | 74° 25' | 49° 49' | 403 |
| Quebec City, Que. | 71° 24' | 46° 48' | 74 |
| Maniwaki, Que. | 75° 58' | 46° 23' | 171 |
| St. Hubert, Que. | 73° 25' | 45° 31' | 28 |
| Charlo, NB. | 66° 20' | 48° 00' | 39 |
| Acadia Fes, NB. | 66° 22' | 46° 00' | 62 |
| Saint John, NB. | 65° 53' | 45° 19' | 110 |
| Truro, NS. | 63° 16' | 45° 22' | 41 |
| Sable Island, NS. | 60° 01' | 43° 56' | 5 |
| Kejimkujik, NS. | 65° 02' | 44° 26' | 127 |
| Shelburne, NS. | 65° 15' | 43° 43' | 31 |
| Goose, NF. | 60° 25' | 53° 19' | 30 |
| Gander, NF. | 54° 34' | 48° 57' | 152 |
| Stephenville, NF. | 58° 33' | 48° 32' | 27 |

84-404

TABLE B2

AES-CANSAP MONITORING NETWORK ANNUAL AVERAGE CONCENTRATIONS AND DEPOSITIONS FOR 1982

| Site Name | PPTN (cm) | pH | Concentrations (mg/L) | | | Depositions ($g/m^2/a$) | | |
|---|---|---|---|---|---|---|---|---|
| | | | $SO_4^=$ | $NO_3^-$ | $H^+$ | $SO_4^=$ | $NO_3^-$ | $H^+$ |
| Bissett | 59.2 | 4.91 | 1.34 | 0.44 | 0.012 | 0.79 | 0.26 | 0.007 |
| Trout Lake | 71.7 | 5.59 | 1.35 | 0.32 | 0.003 | 0.97 | 0.23 | 0.002 |
| Moosonee | 72.8 | 4.98 | 2.34 | 0.70 | 0.010 | 1.70 | 0.51 | 0.008 |
| Pickle Lake | 72.8 | 4.66 | 1.33 | 0.73 | 0.022 | 0.97 | 0.54 | 0.016 |
| Kapuskasing | 92.4 | 5.00 | 3.05 | 0.77 | 0.010 | 2.82 | 0.71 | 0.009 |
| Atikokan | 82.2 | 4.75 | 1.51 | 1.02 | 0.018 | 1.24 | 0.84 | 0.015 |
| Dorset | 113.6 | 4.08 | 2.97 | 2.05 | 0.083 | 3.37 | 2.33 | 0.094 |
| Kingston | 101.6 | 3.96 | 4.33 | 4.03 | 0.109 | 4.40 | 4.09 | 0.110 |
| Peterborough | 88.8 | 4.19 | 3.71 | 2.50 | 0.064 | 3.29 | 2.22 | 0.057 |
| Mount Forest | 100.8 | 4.66 | 5.05 | 3.44 | 0.022 | 5.09 | 3.47 | 0.022 |
| Simcoe | 100.9 | 3.99 | 4.61 | 3.09 | 0.101 | 4.65 | 3.12 | 0.102 |
| Fort Chimo | 47.2 | 5.10 | 1.28 | 0.26 | 0.008 | 0.60 | 0.12 | 0.004 |
| Nitchequon | 91.5 | 5.19 | 1.01 | 2.50 | 0.006 | 0.92 | 2.22 | 0.006 |
| Sept Isles | 113.9 | 4.45 | 1.74 | 0.64 | 0.035 | 1.98 | 0.73 | 0.040 |
| Maniwaki | 79.0 | 4.31 | 2.90 | 2.06 | 0.049 | 2.29 | 1.63 | 0.038 |
| Charlo | 89.0 | 4.62 | 2.15 | 0.65 | 0.024 | 1.91 | 0.58 | 0.021 |
| Acadia Fes | 126.6 | 4.46 | 1.50 | 0.61 | 0.034 | 1.90 | 0.77 | 0.043 |
| Saint John | 143.1 | 4.51 | 2.64 | 1.33 | 0.031 | 3.78 | 1.91 | 0.044 |
| Truro | 101.8 | 4.37 | 2.28 | 0.77 | 0.043 | 2.32 | 0.78 | 0.043 |
| Kejimkujik | 127.8 | 4.51 | 1.43 | 0.65 | 0.031 | 1.82 | 0.83 | 0.039 |
| Shelbourne | 129.4 | 4.40 | 1.83 | 0.74 | 0.039 | 2.36 | 0.96 | 0.051 |
| Goose | 100.3 | 4.95 | 0.71 | 0.34 | 0.011 | 0.72 | 0.34 | 0.011 |
| Stephenville | 168.6 | 4.61 | 1.96 | 0.59 | 0.024 | 3.30 | 1.00 | 0.041 |

TABLE B3

AES-CANSAP MONITORING NETWORK ANNUAL AVERAGE CONCENTRATIONS AND DEPOSITIONS FOR 1981

| Site Name | PPTN (cm) | pH | Concentrations (mg/L) | | | Depositions ($g/m^2/a$) | | |
|---|---|---|---|---|---|---|---|---|
| | | | $SO_4^=$ | $NO_3^-$ | $H^+$ | $SO_4^=$ | $NO_3^-$ | $H^+$ |
| Bissett | 48.4 | 5.04 | 0.82 | 0.28 | 0.009 | 0.40 | 0.14 | 0.004 |
| Trout Lake | 61.3 | 6.38 | 1.57 | 0.72 | 0.0004 | 0.97 | 0.44 | 0.0003 |
| Moosonee | 57.6 | 5.16 | 1.36 | 0.54 | 0.007 | 0.78 | 0.31 | 0.004 |
| Pickle Lake | 48.1 | 5.20 | 1.52 | 0.75 | 0.006 | 0.73 | 0.36 | 0.003 |
| ELA | 68.3 | 4.93 | 0.92 | 0.86 | 0.012 | 0.63 | 0.59 | 0.008 |
| Atikokan | 58.9 | 4.89 | 1.90 | 1.23 | 0.013 | 1.12 | 0.72 | 0.007 |
| Dorset | 93.5 | 4.16 | 3.71 | 2.42 | 0.069 | 3.47 | 2.27 | 0.065 |
| Kingston | 98.3 | 4.04 | 4.03 | 3.94 | 0.091 | 3.96 | 3.87 | 0.089 |
| Peterborough | 87.5 | 4.23 | 3.39 | 2.41 | 0.058 | 2.96 | 2.10 | 0.051 |
| Mount Forest | 88.4 | 4.31 | 4.25 | 2.63 | 0.048 | 3.76 | 2.32 | 0.042 |
| Simcoe | 88.7 | 4.05 | 4.24 | 3.10 | 0.088 | 3.76 | 2.75 | 0.078 |
| Harrow | 105.9 | 4.12 | 4.90 | 2.74 | 0.074 | 5.19 | 2.90 | 0.079 |
| Fort Chimo | 46.7 | 5.27 | 1.13 | 0.44 | 0.005 | 0.53 | 0.20 | 0.0025 |
| Nitchequon | 79.3 | 4.86 | 0.93 | 0.28 | 0.014 | 0.74 | 0.22 | 0.011 |
| Sept Isles | 120.1 | 4.54 | 1.44 | 0.54 | 0.028 | 1.73 | 0.65 | 0.034 |
| Chibougamu | 85.6 | 4.48 | 1.90 | 1.03 | 0.033 | 1.63 | 0.88 | 0.028 |
| Maniwaki | 88.8 | 4.23 | 3.21 | 1.90 | 0.059 | 2.85 | 1.69 | 0.052 |
| St. Hubert | 110.6 | 4.48 | 4.72 | 2.32 | 0.033 | 5.22 | 2.56 | 0.036 |
| Charlo | 119.7 | 4.66 | 2.11 | 0.75 | 0.022 | 2.52 | 0.90 | 0.026 |
| Acadia Fes | 153.1 | 4.36 | 1.80 | 0.79 | 0.043 | 2.75 | 1.21 | 0.067 |
| Saint John | 134.6 | 4.64 | 1.99 | 0.94 | 0.023 | 2.68 | 1.26 | 0.031 |
| Truro | 130.7 | 4.43 | 2.13 | 0.79 | 0.037 | 2.79 | 1.03 | 0.048 |
| Kejimkujik | 157.3 | 4.50 | 1.34 | 0.63 | 0.031 | 2.11 | 0.99 | 0.049 |
| Shelbourne | 152.7 | 4.49 | 1.46 | 0.74 | 0.032 | 2.23 | 1.13 | 0.048 |
| Goose | 115.5 | 5.19 | 0.77 | 0.13 | 0.006 | 0.89 | 0.15 | 0.007 |
| Gander | 128.3 | 4.84 | 0.96 | 0.29 | 0.014 | 1.23 | 0.37 | 0.018 |
| Stephenville | 103.7 | 4.67 | 1.72 | 0.08 | 0.021 | 1.79 | 0.08 | 0.022 |

TABLE B4

AES-CANSAP MONITORING NETWORK ANNUAL AVERAGE CONCENTRATIONS AND DEPOSITIONS FOR 1980

| Site Name | PPTN (cm) | pH | Concentrations (mg/L) | | | Depositions ($g/m^2/a$) | | |
|---|---|---|---|---|---|---|---|---|
| | | | $SO_4^=$ | $NO_3^-$ | $H^+$ | $SO_4^=$ | $NO_3^-$ | $H^+$ |
| Bissett | 54.2 | 5.16 | 0.87 | 0.30 | 0.007 | 0.47 | 0.16 | 0.004 |
| Moosonee | 54.0 | 5.04 | 1.33 | 0.81 | 0.009 | 0.72 | 0.44 | 0.005 |
| ELA | 50.9 | 5.00 | 1.17 | 0.91 | 0.010 | 0.60 | 0.46 | 0.005 |
| Dorset | 116.9 | 4.19 | 3.01 | 2.00 | 0.065 | 3.52 | 2.34 | 0.075 |
| Kingston | 89.7 | 4.23 | 3.98 | 3.21 | 0.058 | 3.57 | 2.88 | 0.052 |
| Peterborough | 94.4 | 4.41 | 3.91 | 3.26 | 0.040 | 3.69 | 3.08 | 0.038 |
| Mount Forest | 91.9 | 4.92 | 4.20 | 3.17 | 0.012 | 3.86 | 2.92 | 0.011 |
| Simcoe | 80.1 | 4.13 | 4.01 | 2.86 | 0.074 | 3.21 | 2.29 | 0.059 |
| Harrow | 97.3 | 4.35 | 4.87 | 2.71 | 0.045 | 4.74 | 2.64 | 0.043 |
| Fort Chimo | 42.1 | 5.36 | 0.82 | 0.41 | 0.004 | 0.34 | 0.17 | 0.002 |
| Nitchequon | 81.8 | 4.97 | 0.98 | 0.15 | 0.011 | 0.80 | 0.12 | 0.009 |
| Sept Isles | 130.8 | 4.52 | 1.54 | 0.65 | 0.030 | 2.01 | 0.85 | 0.039 |
| Chibougamu | 98.1 | 4.50 | 1.54 | 0.92 | 0.031 | 1.51 | 0.90 | 0.031 |
| Quebec City | 118.4 | 4.24 | 3.99 | 1.94 | 0.058 | 4.72 | 2.29 | 0.068 |
| Maniwaki | 99.9 | 4.30 | 2.99 | 1.87 | 0.049 | 2.99 | 1.87 | 0.049 |
| St. Hubert | 95.0 | 4.29 | 3.55 | 2.29 | 0.051 | 3.38 | 2.18 | 0.049 |
| Charlo | 130.2 | 4.75 | 2.27 | 0.78 | 0.018 | 2.96 | 1.01 | 0.023 |
| Acadia Fes | 126.4 | 4.35 | 2.17 | 1.15 | 0.045 | 2.75 | 1.45 | 0.056 |
| Saint John | 125.1 | 4.40 | 2.81 | 1.23 | 0.039 | 3.52 | 1.54 | 0.049 |
| Truro | 107.3 | 4.34 | 2.71 | 1.09 | 0.045 | 2.91 | 1.17 | 0.048 |
| Kejimkujik | 105.2 | 4.48 | 1.66 | 0.71 | 0.032 | 1.74 | 0.75 | 0.034 |
| Goose | 103.9 | 4.91 | 0.98 | 0.19 | 0.012 | 1.02 | 0.19 | 0.013 |

TABLE B5

AES-CANSAP MONITORING NETWORK ANNUAL AVERAGE
CONCENTRATIONS AND DEPOSITIONS FOR 1978 & 1979

| Site Name | PPTN (cm) | pH | Concentrations (mg/L) | | | Depositions ($g/m^2/a$) | | |
|---|---|---|---|---|---|---|---|---|
| | | | $SO_4^=$ | $NO_3^-$ | $H^+$ | $SO_4^=$ | $NO_3^-$ | $H^+$ |
| 1979 | | | | | | | | |
| Pickle Lake | 60.3 | 5.00 | 1.7 | 0.89 | 0.010 | 1.75 | 0.92 | 0.010 |
| Atikokan | 71.4 | 4.77 | 2.58 | 1.84 | 0.017 | 1.84 | 1.31 | 0.012 |
| Peterborough | 76.7 | 4.01 | 8.02 | 5.36 | 0.099 | 6.15 | 4.11 | 0.076 |
| Mount Forest | 105.1 | 4.34 | 5.82 | 3.57 | 0.046 | 6.12 | 3.75 | 0.049 |
| Simcoe | 96.0 | 4.05 | 6.52 | 4.09 | 0.090 | 6.26 | 3.92 | 0.087 |
| Fort Chimo | 62.3 | 5.05 | 1.08 | 0.45 | 0.009 | 0.67 | 0.29 | 0.006 |
| Nitchequon | 97.8 | 4.62 | 1.42 | 0.70 | 0.024 | 1.39 | 0.50 | 0.023 |
| Chibougamu | 114.9 | 4.35 | 2.78 | 1.25 | 0.045 | 3.19 | 1.43 | 0.052 |
| Maniwaki | 101.8 | 4.19 | 4.82 | 2.78 | 0.065 | 4.91 | 2.83 | 0.066 |
| Truro | 155.7 | 4.51 | 2.11 | 0.85 | 0.031 | 3.29 | 1.33 | 0.048 |
| 1978 | | | | | | | | |
| Atikokan | 67.2 | 4.90 | 1.82 | 1.31 | 0.013 | 1.22 | 0.88 | 0.009 |
| Kingston | 89.6 | 4.47 | 7.13 | 4.66 | 0.034 | 6.39 | 4.17 | 0.030 |
| Simcoe | 87.2 | 4.24 | 7.40 | 4.91 | 0.058 | 6.45 | 4.28 | 0.051 |
| Nitchequon | 104.6 | 4.84 | 1.45 | 0.48 | 0.015 | 1.39 | 0.50 | 0.015 |
| Sept Isles | 87.9 | 4.36 | 2.90 | 1.31 | 0.044 | 2.55 | 1.15 | 0.038 |
| St. Hubert | 102.9 | 4.25 | 9.22 | 3.97 | 0.056 | 9.49 | 4.09 | 0.057 |
| Charlo | 90.9 | 4.35 | 4.21 | 1.45 | 0.045 | 3.83 | 1.32 | 0.041 |
| Saint John | 123.9 | 4.55 | 3.47 | 1.23 | 0.028 | 4.30 | 1.53 | 0.035 |
| Truro | 108.3 | 4.53 | 2.88 | 1.07 | 0.030 | 3.12 | 1.15 | 0.032 |
| Goose | 101.2 | 4.71 | 1.73 | 0.47 | 0.019 | 1.75 | 0.48 | 0.020 |

FIGURE B3

Details and Locations of APIOS Daily Sampling Sites

| Site No | Name | Location Longitude | Latitude | Elev. (m) |
|---|---|---|---|---|
| 1 | Melbourne | 81°33'23" | 42°47'15" | 213 |
| 2 | Longwoods | 81°28'50" | 42°53'02" | 239 |
| 3 | North Easthope | 80°53'35" | 43°24'21" | 375 |
| 4 | Wellesley | 80°45'35" | 43°28'13" | 344 |
| 5 | Raven Lake | 78°54'43" | 44°36'40" | 274 |
| 6 | Balsam Lake | 78°51'22" | 44°37'35" | 259 |
| 7 | Nithgrove | 79°04'14" | 45°12'01" | 325 |
| 8 | Dorset | 78°55'49" | 45°13'23" | 320 |
| 9 | Whitman Creek | 76°49'19" | 44°29'07" | 137 |
| 10 | Railton | 76°35'33" | 44°22'34" | 156 |
| 11 | Charleston Lake | 76°02'30" | 44°29'54" | 130 |
| 12 | Graham Lake | 75°51'44" | 44°35'22" | 92 |
| 13 | Forbes Township | 89°38'56" | 48°34'58" | 324 |
| 14 | Quetico Centre | 91°12'08" | 48°24'44" | 420 |
| 15 | Lac La Croix | 92°12'32" | 48°21'14" | 368 |
| 16 | Fernberg | 91°29'26" | 47°56'51" | 506 |

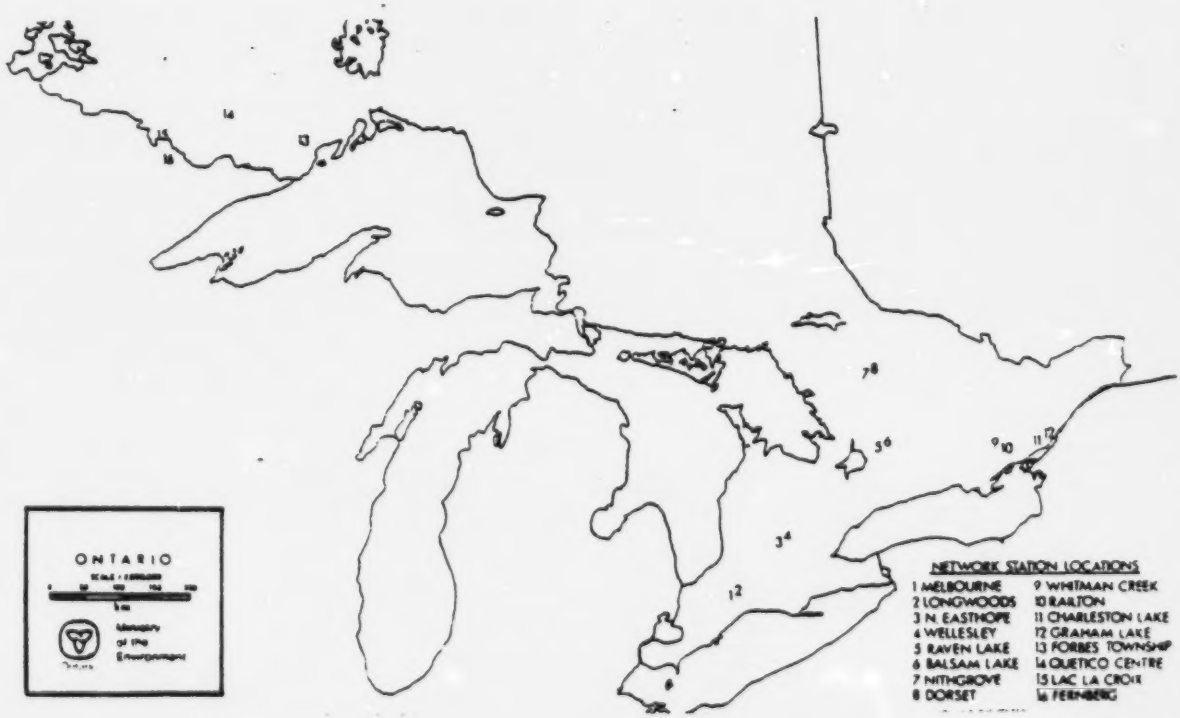


TABLE B6

ONTARIO MINISTRY OF THE ENVIRONMENT - APIOS DAILY MONITORING
NETWORK ANNUAL AVERAGE CONCENTRATIONS AND DEPOSITIONS FOR 1981 AND 1982

| Map Code | Site Name | PPTN (cm) | pH | Concentrations (mg/L) | | | Depositions ($g/m^2/a$) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | $SO_4^=$ | $NO_3^-$ | $H^+$ | $SO_4^=$ | $NO_3^-$ | $H^+$ |
| | | | | 1982 | | | | | |
| 1 | Melbourne | 89.3 | 4.11 | 3.25 | 1.94 | 0.077 | 2.90 | 1.73 | 0.068 |
| 2 | Longwoods | 98.9 | 4.20 | 2.96 | 1.84 | 0.062 | 2.92 | 1.82 | 0.061 |
| 3 | North Easthope | 107.0 | 4.23 | 3.13 | 1.88 | 0.058 | 3.35 | 2.01 | 0.062 |
| 4 | Wellesley | 112.6 | 4.22 | 3.04 | 1.77 | 0.059 | 3.42 | 1.99 | 0.067 |
| 5 | Raven Lake | 91.8 | 4.18 | 2.68 | 1.84 | 0.065 | 2.46 | 1.69 | 0.060 |
| 6 | Balsam Lake | 85.9 | 4.17 | 2.88 | 1.79 | 0.067 | 2.44 | 1.54 | 0.058 |
| 7 | Nithgrove | 111.4 | 4.26 | 2.46 | 1.61 | 0.054 | 2.74 | 1.80 | 0.060 |
| 8 | Dorset | 113.0 | 4.23 | 2.55 | 1.72 | 0.059 | 2.88 | 1.95 | 0.066 |
| 9 | Whitman Creek | 58.5 | 4.12 | 3.09 | 2.25 | 0.075 | 1.81 | 1.32 | 0.044 |
| 10 | Railton | 86.8 | 4.13 | 2.90 | 1.86 | 0.072 | 2.52 | 1.61 | 0.063 |
| 11 | Charleston Lake | 83.8 | 4.06 | 3.36 | 1.93 | 0.086 | 2.82 | 1.61 | 0.072 |
| 12 | Graham Lake | 91.6 | 4.15 | 3.17 | 2.06 | 0.070 | 2.91 | 1.89 | 0.065 |
| 13 | Forbes Twp | 81.7 | 4.74 | 1.23 | 0.97 | 0.018 | 1.04 | 0.79 | 0.015 |
| 14 | Quetico Center | 73.4 | 4.82 | 1.05 | 0.86 | 0.015 | 0.77 | 0.63 | 0.011 |
| 16 | Fernberg | 79.4 | 4.82 | 0.98 | 0.75 | 0.015 | 0.78 | 0.59 | 0.012 |
| | | | | 1981 | | | | | |
| 1 | Melbourne | 80.4 | 4.13 | 3.35 | 2.41 | 0.074 | 2.69 | 1.94 | 0.059 |
| 2 | Longwoods | 91.3 | 4.15 | 3.56 | 2.50 | 0.071 | 3.25 | 2.30 | 0.065 |
| 3 | North Easthope | 92.5 | 4.09 | 3.79 | 2.23 | 0.081 | 3.51 | 2.08 | 0.075 |
| 4 | Wellesley | 85.1 | 4.15 | 3.37 | 2.14 | 0.070 | 2.87 | 1.82 | 0.060 |
| 5 | Raven Lake | 79.3 | N/A* | 3.27 | 2.19 | N/A | 2.59 | 1.73 | N/A |
| 6 | Balsam Lake | 74.2 | 4.17 | 3.00 | 2.01 | 0.066 | 2.23 | 1.55 | 0.049 |
| 7 | Nithgrove | 88.3 | 4.17 | 3.05 | 2.02 | 0.066 | 2.69 | 1.77 | 0.058 |
| 8 | Dorset | 92.8 | 4.16 | 3.03 | 2.06 | 0.068 | 2.81 | 1.91 | 0.063 |
| 9 | Whitman Creek | 97.9 | N/A | 3.59 | 2.26 | N/A | 3.51 | 2.21 | N/A |
| 10 | Railton | 99.5 | N/A | 3.10 | 2.22 | N/A | 3.08 | 2.21 | N/A |
| 11 | Charleston Lake | 100.8 | N/A | 2.77 | 2.01 | N/A | 2.79 | 2.03 | N/A |
| 12 | Graham Lake | 102.9 | N/A | 2.96 | 2.45 | N/A | 3.05 | 2.52 | N/A |

* N/A - Not available

FIGURE B4

DETAILS AND LOCATIONS OF
APIOS CUMULATIVE SAMPLING SITES

| MOE REGION | STATION NAME | | ELEVATION (m above MSL) | LATITUDE (North) | LONGITUDE (West) |
|---|---|---|---|---|---|
| Southwestern | Colchester | 1 | 183 | 41°59'15" | 82°55'41" |
| | Merlin | 2 | 191 | 42°14'47" | 82°13'30" |
| | Pt. Stanley | 3 | 213 | 42°40'22" | 81°09'55" |
| | Wilkesport | 4 | 183 | 42°42'11" | 82°21'13" |
| | Alvinston | 5 | 221 | 42°49'36" | 81°50'04" |
| | Shallow Lake | 9 | 229 | 44°34'54" | 81°05'24" |
| | Palmerston | 8 | 389 | 43°48'19" | 80°34'12" |
| | Huron Park | 6 | 250 | 43°17'28" | 81°30'03" |
| | Waterloo | 7 | 343 | 43°28'39" | 80°35'09" |
| Central | Dorset | 20 | 320 | 45°13'26" | 78°55'32" |
| | Milton | 10 | 221 | 43°31'05" | 79°55'54" |
| | Uxbridge | 11 | 244 | 44°12'46" | 79°12'38" |
| | Wilberforce | 18 | 396 | 45°00'54" | 78°12'58" |
| | Campbellford | 13 | 175 | 44°17'28" | 77°47'33" |
| | Coldwater | 12 | 280 | 44°37'31" | 79°32'08" |
| Southeastern | Kaladar | 14 | 244 | 44°41'31" | 77°09'18" |
| | Smith's Falls | 15 | 122 | 44°56'41" | 75°57'48" |
| | Dalhousie Mills | 16 | 69 | 45°19'00" | 74°28'13" |
| | Golden Lake | 17 | 160 | 45°36'48" | 77°12'03" |
| Northeastern | McKellar | 21 | 244 | 45°30'37" | 79°35'19" |
| | Killarney | 23 | 183 | 45°59'26" | 81°29'18" |
| | Mattawa | 22 | 198 | 46°16'45" | 78°49'19" |
| | Bear Island | 24 | 305 | 46°38'22" | 80°04'40" |
| | Ramsey | 26 | 427 | 47°26'33" | 82°20'14" |
| | Gowganda | 25 | 343 | 47°39'04" | 80°46'32" |
| | Moonbeam | 27 | 244 | 49°19'16" | 82°08'46" |
| | Attawapiskat | 28 | 9 | 52°56'00" | 82°24'00" |
| | Whitney | 19 | 412 | 45°32'21" | 78°13'33" |
| Northwestern | Dorion | 31 | 244 | 48°50'33" | 88°36'45" |
| | Nakina | 30 | 320 | 50°10'38" | 86°42'40" |
| | Ear Falls | 35 | 350 | 50°38'31" | 93°13'13" |
| | Pickle Lake | 36 | 360 | 51°27'41" | 90°12'04" |
| | Lac la Croix | 33 | 368 | 48°21'14" | 92°12'32" |
| | Quetico Centre | 32 | 420 | 48°44'24" | 91°12'08" |
| | E.L.A. | 34 | 123 | 49°39'22" | 93°43'28" |
| | Winisk | 29 | 9 | 55°12'00" | 85°08'00" |

TABLE B7

OME - APIOS CUMULATIVE NETWORK ANNUAL
AVERAGE CONCENTRATIONS AND DEPOSITIONS FOR 1982

| Map Code | Site Name | PPTN (cm) | pH | Concentrations (mg/L) | | | Depositions ($g/m^2/a$) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | $SO_4^=$ | $NO_3^-$ | $H^+$ | $SO_4^=$ | $NO_3^-$ | $H^+$ |
| 1 | Colchester | 78.1 | 4.39 | 5.57 | 2.83 | 0.041 | 4.35 | 2.21 | 0.032 |
| 2 | Merlin | 89.4 | 3.81 | 4.16 | 2.37 | 0.156 | 3.72 | 2.12 | 0.140 |
| 3 | Port Stanley | 96.5 | 4.10 | 4.55 | 2.80 | 0.079 | 4.39 | 2.70 | 0.076 |
| 4 | Wilkesport | 69.9 | 4.31 | 4.74 | 2.61 | 0.049 | 3.31 | 1.83 | 0.035 |
| 5 | Alvinston | 84.9 | 4.49 | 3.80 | 2.61 | 0.032 | 3.23 | 2.57 | 0.027 |
| 6 | Huron Park | 84.4 | 4.31 | 4.67 | 2.90 | 0.049 | 4.13 | 2.44 | 0.042 |
| 7 | Waterloo | 100.9 | 4.28 | 4.07 | 2.66 | 0.053 | 4.11 | 2.69 | 0.053 |
| 8 | Palmerston | 93.4 | 4.25 | 3.63 | 2.44 | 0.056 | 3.39 | 2.27 | 0.052 |
| 9 | Shallow Lake | 98.3 | 4.27 | 3.11 | 2.36 | 0.054 | 3.06 | 2.32 | 0.053 |
| 11 | Uxbridge | 95.4 | 4.23 | 3.77 | 2.41 | 0.060 | 3.59 | 2.30 | 0.057 |
| 12 | Coldwater | 92.3 | 4.36 | 2.60 | 2.01 | 0.044 | 2.40 | 1.85 | 0.040 |
| 13 | Campbellford | 86.8 | 4.21 | 3.62 | 2.36 | 0.062 | 3.14 | 2.05 | 0.054 |
| 14 | Kaladar | 66.8 | 4.07 | 3.94 | 2.48 | 0.084 | 2.63 | 1.66 | 0.056 |
| 15 | Smith's Falls | 65.2 | 4.25 | 3.63 | 2.38 | 0.056 | 2.37 | 1.55 | 0.037 |
| 16 | Dalhousie Mills | 82.9 | 4.19 | 3.63 | 2.41 | 0.065 | 3.01 | 2.00 | 0.054 |
| 17 | Golden Lake | 64.9 | 4.27 | 2.63 | 1.91 | 0.054 | 1.70 | 1.24 | 0.035 |
| 18 | Wilberforce | 111.0 | 4.20 | 2.99 | 2.25 | 0.063 | 3.32 | 2.50 | 0.070 |
| 19 | Whitney | 88.1 | 4.32 | 2.40 | 1.64 | 0.048 | 2.11 | 1.44 | 0.043 |
| 20 | Dorset | 103.2 | 4.20 | 2.81 | 1.95 | 0.063 | 2.90 | 2.01 | 0.065 |
| 21 | McKellar | 93.4 | 4.19 | 2.79 | 2.31 | 0.064 | 2.60 | 2.15 | 0.060 |
| 22 | Mattawa | 88.8 | 4.24 | 2.44 | 1.90 | 0.058 | 2.17 | 1.69 | 0.051 |
| 23 | Killarney | 75.6 | 4.10 | 3.49 | 2.78 | 0.080 | 2.64 | 2.10 | 0.060 |
| 24 | Bear Island | 64.9 | 4.34 | 2.51 | 1.60 | 0.046 | 1.63 | 1.04 | 0.030 |
| 25 | Gowganda | 53.0 | 4.23 | 2.33 | 1.27 | 0.059 | 1.24 | 0.67 | 0.031 |
| 26 | Ramsey | 68.6 | 4.40 | 1.98 | 1.32 | 0.040 | 1.36 | 0.90 | 0.027 |
| 27 | Moonbeam | 76.6 | 4.55 | 1.76 | 0.92 | 0.028 | 1.34 | 0.70 | 0.022 |
| 30 | Nakina | 63.5 | 5.46 | 1.42 | 0.86 | 0.004 | 0.90 | 0.55 | 0.002 |
| 31 | Dorion | 71.6 | 4.59 | 1.90 | 1.16 | 0.026 | 1.36 | 0.83 | 0.018 |
| 32 | Quetico Centre | 89.9 | 4.91 | 1.21 | 0.95 | 0.012 | 1.08 | 0.85 | 0.011 |
| 33 | Lac LaCroix | 83.0 | 4.97 | 1.32 | 1.08 | 0.011 | 1.09 | 0.90 | 0.009 |
| 34 | Exp Lakes Area | 63.5 | 4.89 | 1.57 | 1.18 | 0.013 | 1.00 | 0.75 | 0.008 |
| 35 | Ear Falls | 62.1 | 5.37 | 1.21 | 0.90 | 0.004 | 0.75 | 0.56 | 0.003 |
| 36 | Pickle Lake | 59.2 | 5.18 | 1.16 | 0.83 | 0.007 | 0.69 | 0.49 | 0.004 |

TABLE B8

OME - APIOS CUMULATIVE NETWORK ANNUAL
AVERAGE CONCENTRATIONS AND DEPOSITIONS FOR 1981

| Map Code | Site Name | PPTN (cm) | pH | Concentrations (mg/L) | | | Depositions ($g/m^2/a$) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | $SO_4^=$ | $NO_3^-$ | $H^+$ | $SO_4^=$ | $NO_3^-$ | $H^+$ |
| 1 | Colchester | 88.5 | 4.06 | 5.05 | 2.74 | 0.086 | 4.47 | 2.42 | 0.076 |
| 2 | Merlin | 94.4 | 4.11 | 4.78 | 2.80 | 0.077 | 4.51 | 2.65 | 0.073 |
| 3 | Port Stanley | 78.9 | 4.06 | 4.66 | 2.89 | 0.085 | 3.68 | 2.28 | 0.067 |
| 4 | Wilkesport | 81.0 | 4.20 | 5.38 | 3.08 | 0.062 | 4.36 | 2.50 | 0.050 |
| 5 | Alvinston | 106.6 | 4.19 | 4.11 | 2.78 | 0.063 | 4.39 | 2.96 | 0.067 |
| 7 | Waterloo | 86.4 | 4.08 | 4.03 | 2.81 | 0.083 | 3.48 | 2.43 | 0.071 |
| 8 | Palmerston | 88.1 | 4.28 | 4.49 | 2.46 | 0.051 | 3.95 | 2.17 | 0.045 |
| 9 | Shallow Lake | 91.6 | 4.19 | 3.58 | 2.47 | 0.063 | 3.28 | 2.26 | 0.058 |
| 10 | Milton | 81.9 | 4.16 | 4.73 | 2.84 | 0.068 | 3.87 | 2.32 | 0.056 |
| 11 | Uxbridge | 89.6 | 4.17 | 4.29 | 2.61 | 0.067 | 3.85 | 2.34 | 0.060 |
| 13 | Campbellford | 83.7 | 4.23 | 3.53 | 2.42 | 0.058 | 2.96 | 2.02 | 0.049 |
| 14 | Kaladar | 103.9 | 4.16 | 3.63 | 2.28 | 0.069 | 3.77 | 2.37 | 0.072 |
| 15 | Smith's Falls | 101.0 | 4.43 | 3.43 | 2.15 | 0.037 | 3.47 | 2.18 | 0.037 |
| 16 | Dalhousie Mills | 98.8 | 4.20 | 3.31 | 2.12 | 0.062 | 3.27 | 2.10 | 0.061 |
| 17 | Golden Lake | 87.9 | 4.15 | 3.53 | 2.14 | 0.069 | 3.10 | 1.88 | 0.061 |
| 18 | Wilberforce | 91.4 | 4.17 | 3.67 | 2.21 | 0.067 | 3.35 | 2.02 | 0.061 |
| 19 | Whitney | 101.5 | 4.22 | 2.85 | 1.66 | 0.060 | 2.89 | 1.69 | 0.060 |
| 20 | Dorset | 95.7 | 4.18 | 3.64 | 2.27 | 0.066 | 3.49 | 2.17 | 0.063 |
| 21 | McKellar | 107.2 | 4.21 | 3.17 | 2.30 | 0.060 | 3.39 | 2.47 | 0.065 |
| 22 | Mattawa | 76.5 | 4.27 | 3.12 | 1.68 | 0.053 | 2.39 | 1.28 | 0.041 |
| 23 | Killarney | 68.1 | 4.14 | 3.67 | 2.33 | 0.071 | 2.50 | 1.59 | 0.049 |
| 24 | Bear Island | 79.5 | 4.36 | 3.01 | 1.55 | 0.043 | 2.39 | 1.23 | 0.034 |
| 25 | Gowganda | 71.4 | 4.37 | 3.25 | 1.43 | 0.042 | 2.32 | 1.02 | 0.030 |
| 26 | Ramsey | 75.2 | 4.39 | 2.25 | 1.36 | 0.041 | 1.69 | 1.02 | 0.031 |
| 27 | Moonbeam | 62.8 | 4.43 | 1.84 | 1.16 | 0.037 | 1.16 | 0.73 | 0.023 |
| 28 | Attawapiskat | 68.9 | 4.48 | 1.35 | 0.88 | 0.033 | 0.93 | 0.61 | 0.023 |
| 30 | Nakina | 42.8 | 4.57 | 1.78 | 1.25 | 0.027 | 0.76 | 0.54 | 0.011 |
| 31 | Dorion | 64.2 | 4.52 | 1.69 | 1.38 | 0.030 | 1.09 | 0.88 | 0.019 |
| 35 | Ear Falls | 52.6 | 5.01 | 1.20 | 0.99 | 0.010 | 0.63 | 0.52 | 0.005 |
| 36 | Pickle Lake | 50.9 | 5.24 | 1.13 | 0.87 | 0.006 | 0.57 | 0.44 | 0.003 |

FIGURE B5

Details and Locations for Ontario Hydro Air and Precipitation Monitoring Sites

| Site No | Site Name | Location Longitude | Location Latitude | Elev. (m) |
|---|---|---|---|---|
| 1 | Essex | 82°53'42" | 42°01'54" | 195 |
| 2 | Orangeville | 80°02'00" | 43°58'24" | 419 |
| 3 | Dorset | 78°55'48" | 45°13'30" | 320 |
| 4 | Vankleek Hill | 74°39'12" | 45°31'24" | 114 |
| 5 | Winchester | 75°21'06" | 45°05'12" | 76 |
| 6 | Toronto | 79°33'48" | 43°37'42" | 115 |
| 7 | Mississagi | 83°22'48" | 46°25'48" | 229 |
| 8 | Kapuskasing | 82°20'24" | 49°12'24" | 308 |
| 9 | Peacock Point | 79°59'00" | 42°47'36" | 183 |
| 10 | Burlington | 79°50'00" | 43°18'00" | 140 |
| 11 | Pinard | 81°36'00" | 49°51'24" | 229 |

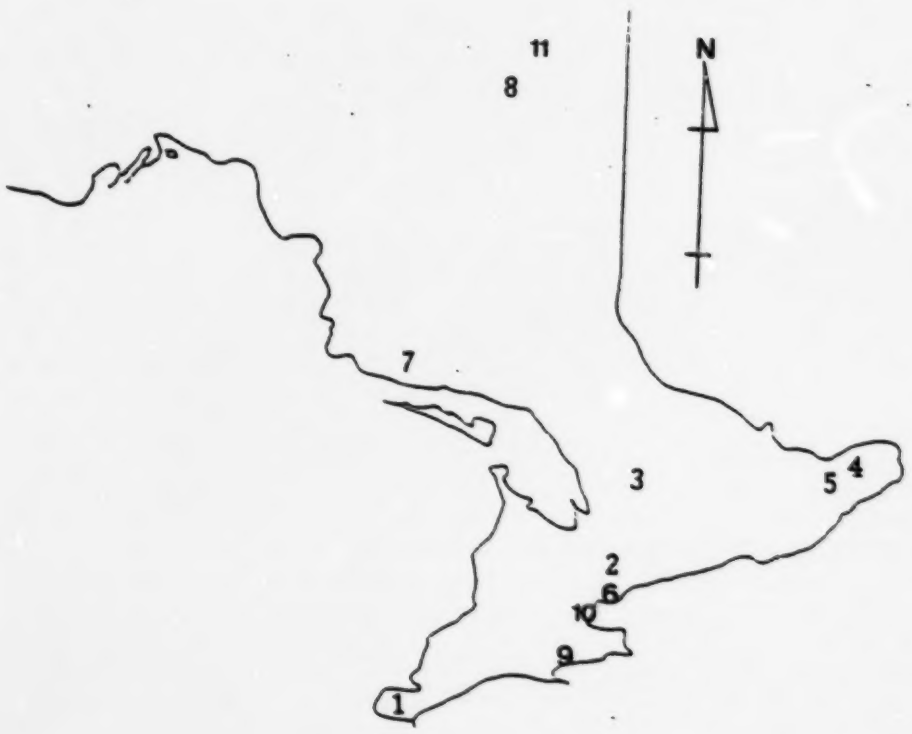


TABLE B9

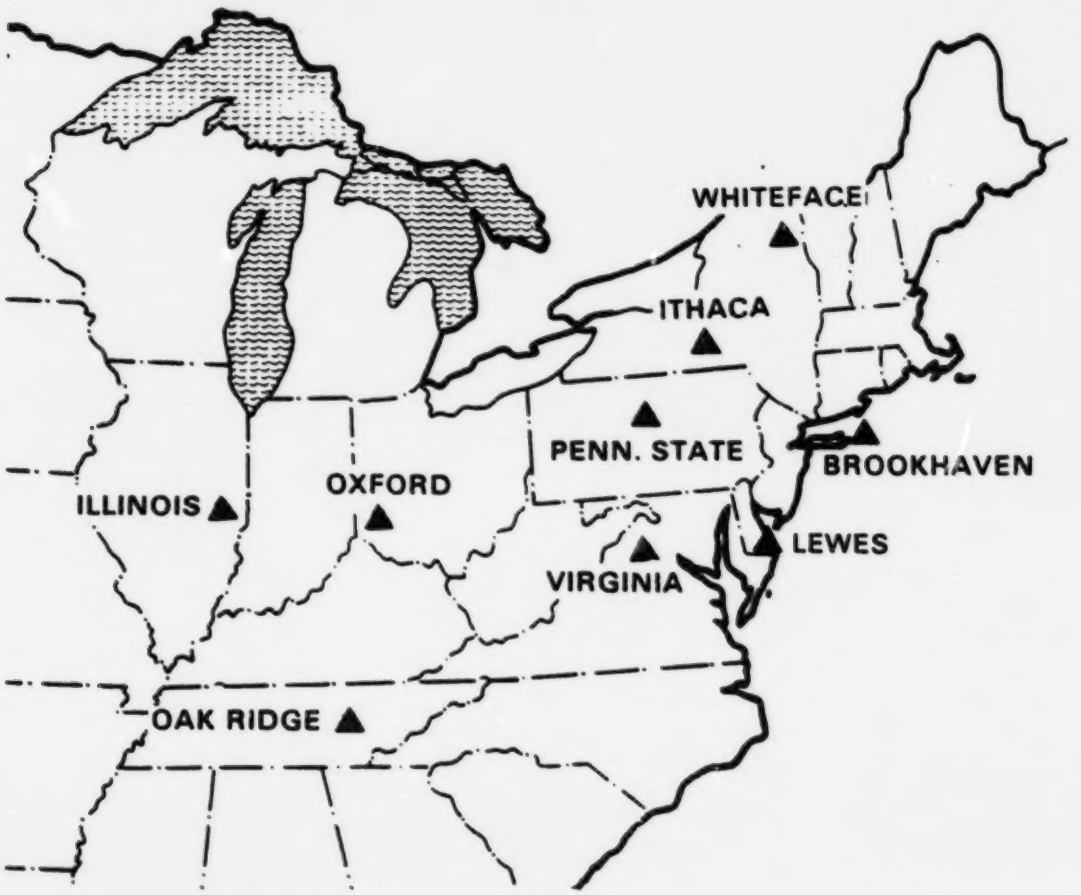
ONTARIO HYDRO MONITORING NETWORK ANNUAL AVERAGE CONCENTRATIONS AND DEPOSITIONS FOR 1978 TO 1982

| Site Name | PPTN (cm) | pH | Concentrations (mg/L) | | | Depositions ($g/m^2/a$) | | |
|---|---|---|---|---|---|---|---|---|
| | | | $SO_4^=$ | $NO_3^-$ | $H^+$ | $SO_4^=$ | $NO_3^-$ | $H^+$ |
| 1978 | | | | | | | | |
| Peacock Pt | 47.4 | 4.37 | 5.63 | 4.63 | 0.043 | 2.67 | 2.19 | 0.020 |
| Burlington | 50.0 | 4.87 | 5.84 | 4.44 | 0.013 | 2.92 | 2.22 | 0.009 |
| Toronto (427 & 5) | 64.7 | 4.35 | 4.59 | 3.76 | 0.045 | 2.97 | 2.44 | 0.029 |
| 1979 | | | | | | | | |
| Peacock Pt | 56.4 | 4.28 | 7.54 | 4.81 | 0.052 | 4.25 | 2.71 | 0.030 |
| Burlington | 53.2 | 4.81 | 5.06 | 4.00 | 0.015 | 2.69 | 2.13 | 0.008 |
| Vankleek Hill | 60.7 | 4.87 | 4.35 | 2.97 | 0.014 | 2.64 | 1.81 | 0.008 |
| Pinard | 36.6 | 4.75 | 3.11 | 1.44 | 0.018 | 1.14 | 0.53 | 0.007 |
| Toronto (427 & 5) | 68.2 | 4.28 | 4.36 | 3.24 | 0.053 | 2.97 | 2.21 | 0.036 |
| 1980 | | | | | | | | |
| Essex | 77.1 | 4.26 | 4.86 | 3.15 | 0.055 | 3.75 | 2.43 | 0.043 |
| Muskoka (Dorset) | 85.0 | 4.24 | 3.56 | 2.85 | 0.058 | 3.02 | 2.42 | 0.049 |
| Vankleek Hill | 71.8 | 4.26 | 3.96 | 2.92 | 0.055 | 2.84 | 2.09 | 0.039 |
| Toronto (427 & 5) | 57.2 | 4.37 | 4.31 | 3.19 | 0.043 | 2.47 | 1.83 | 0.024 |
| 1981 | | | | | | | | |
| Essex | 76.2 | 4.25 | 4.37 | 2.50 | 0.056 | 3.33 | 1.91 | 0.043 |
| Toronto (427 & 5) | 66.5 | 4.40 | 4.29 | 2.88 | 0.040 | 2.85 | 1.92 | 0.027 |
| Dorset | 51.1 | 4.38 | 4.17 | 2.10 | 0.042 | 2.13 | 1.07 | 0.022 |
| 1982 | | | | | | | | |
| Essex | 71.9 | 4.44 | 3.48 | 1.91 | 0.036 | 2.50 | 1.38 | 0.026 |
| Mississagi | 56.3 | 4.42 | 1.96 | 1.91 | 0.038 | 1.01 | 0.99 | 0.020 |
| Kapuskasing | 48.4 | 5.33 | 1.68 | 0.86 | 0.005 | 0.81 | 0.42 | 0.002 |
| Dorset | 89.1 | 4.23 | 2.70 | 1.87 | 0.059 | 2.41 | 1.67 | 0.052 |
| Orangeville | 67.5 | 4.49 | 3.27 | 2.16 | 0.032 | 2.17 | 1.44 | 0.022 |
| Winchester | 78.4 | 4.45 | 2.94 | 2.25 | 0.035 | 2.30 | 1.76 | 0.028 |

FIGURE B6

Locations and Details of MAP3S Network Sites

| Site No | Site Name | Location Longitude | Location Latitude | Elev. (m) |
|---|---|---|---|---|
| 1 | Whiteface, NY | 73° 51' | 44° 23' | 604 |
| 2 | Ithaca, NY | 76° 43' | 42° 23' | 503 |
| 3 | Penn State, OH | 77° 57' | 40° 47' | 396 |
| 4 | Virginia, VA | 78° 32' | 38° 02' | 171 |
| 5 | Illinois, IL | 88° 22' | 40° 03' | 213 |
| 6 | Brookhaven, NY | 72° 53' | 40° 52' | 24 |
| 7 | Lewes, DE | 75° 00' | 38° 46' | 0 |
| 8 | Oxford, OH | 84° 44' | 39° 32' | 283 |
| 9 | Oak Ridge, TN | 84° 20' | 35° 55' | 341 |






84-404

TABLE B10

US DEPT OF ENERGY MAP3S EVENT MONITORING NETWORK ANNUAL AVERAGE CONCENTRATIONS AND DEPOSITIONS FOR 1980 TO 1982

| Site Name | PPTN (cm) | pH | Concentrations (mg/L) | | | Depositions ($g/m^2/a$) | | |
|---|---|---|---|---|---|---|---|---|
| | | | $SO_4^=$ | $NO_3^-$ | $H^+$ | $SO_4^=$ | $NO_3^-$ | $H^+$ |
| 1980 | | | | | | | | |
| Whiteface | 83.9 | 4.21 | 2.67 | 1.63 | 0.061 | 2.24 | 1.36 | 0.051 |
| Ithaca | 94.9 | 4.18 | 2.64 | 1.92 | 0.065 | 2.50 | 1.82 | 0.062 |
| Penn State | 74.8 | 4.12 | 3.23 | 1.91 | 0.076 | 2.42 | 1.43 | 0.057 |
| Virginia | 84.5 | 4.25 | 2.50 | 1.70 | 0.055 | 2.11 | 1.44 | 0.047 |
| Brookhaven | 81.1 | 4.32 | 2.51 | 1.63 | 0.047 | 2.03 | 1.32 | 0.038 |
| Illinois | 90.1 | 4.21 | 3.31 | 1.75 | 0.061 | 2.98 | 1.58 | 0.055 |
| Lewes | 91.6 | 4.30 | 2.62 | 1.46 | 0.050 | 2.40 | 1.33 | 0.046 |
| Oxford | 93.4 | 4.17 | 3.64 | 1.91 | 0.066 | 3.40 | 1.78 | 0.062 |
| 1981 | | | | | | | | |
| Whiteface | 109.1 | 4.43 | 1.94 | 1.12 | 0.036 | 2.12 | 1.22 | 0.040 |
| Ithaca | 122.2 | 4.14 | 3.52 | 1.93 | 0.072 | 4.30 | 2.35 | 0.086 |
| Penn State | 93.3 | 4.25 | 3.26 | 1.81 | 0.056 | 3.04 | 1.69 | 0.052 |
| Virginia | 90.8 | 4.25 | 3.03 | 1.56 | 0.055 | 2.75 | 1.42 | 0.050 |
| Brookhaven | 97.4 | 4.34 | 2.60 | 1.46 | 0.045 | 2.53 | 1.42 | 0.044 |
| Lewes | 89.1 | 4.33 | 2.64 | 1.36 | 0.046 | 2.35 | 1.21 | 0.041 |
| Oak Ridge | 95.1 | 4.27 | 2.88 | 1.20 | 0.053 | 2.74 | 1.15 | 0.050 |
| Oxford | 76.0 | 4.26 | 2.98 | 1.53 | 0.054 | 2.27 | 1.17 | 0.041 |
| Illinois | 92.9 | 4.31 | 3.36 | 1.56 | 0.049 | 3.12 | 1.45 | 0.045 |
| 1982 | | | | | | | | |
| Whiteface | 82.2 | 4.38 | 1.92 | 1.14 | 0.041 | 1.58 | 0.94 | 0.034 |
| Ithaca | 93.4 | 4.19 | 2.75 | 1.91 | 0.064 | 2.57 | 1.78 | 0.059 |
| Penn State | 85.1 | 4.16 | 3.57 | 2.17 | 0.069 | 3.04 | 1.85 | 0.058 |
| Virginia | 89.7 | 4.18 | 3.00 | 1.83 | 0.066 | 2.69 | 1.64 | 0.059 |
| Illinois | 90.5 | 4.30 | 3.10 | 1.57 | 0.050 | 2.80 | 1.42 | 0.045 |
| Brookhaven | 107.4 | 4.41 | 1.99 | 1.00 | 0.039 | 2.13 | 1.08 | 0.042 |
| Lewes | 98.0 | 4.45 | 2.02 | 1.00 | 0.035 | 1.98 | 0.98 | 0.034 |
| Oxford | 99.0 | 4.26 | 3.24 | 1.43 | 0.054 | 3.20 | 1.42 | 0.054 |
| Oak Ridge | 148.1 | 4.28 | 2.64 | 1.27 | 0.051 | 3.90 | 1.88 | 0.076 |

FIGURE B7

Details and Locations for EPRI/SURE Precipitation Chemistry Sites

| Site No | Name | Location Longitude | Location Latitude | Elev. (m) |
|---|---|---|---|---|
| 1 | Montague, MA | 72°32'08" | 42°32'00" | 73 |
| 2 | Scranton, PA | 75°59'40" | 41°34'30" | 335 |
| 3 | Indian River, DE | 75°14'45" | 38°34'50" | 6 |
| 4 | Duncan Falls, OH | 82°00'45" | 39°58'25" | 250 |
| 5 | Rockport, IN | 87°07'15" | 37°53'40" | 131 |
| 6 | Giles County, TN | 86°54'11" | 35°17'05" | 244 |
| 7 | Roanoke, IN | 85°19'30" | 41°02'08" | 244 |
| 8 | Raleigh, NC | 78°41'11" | 35°44'25" | 128 |
| 9 | Lewisburg, WV | 80°25'00" | 37°50'50" | 701 |

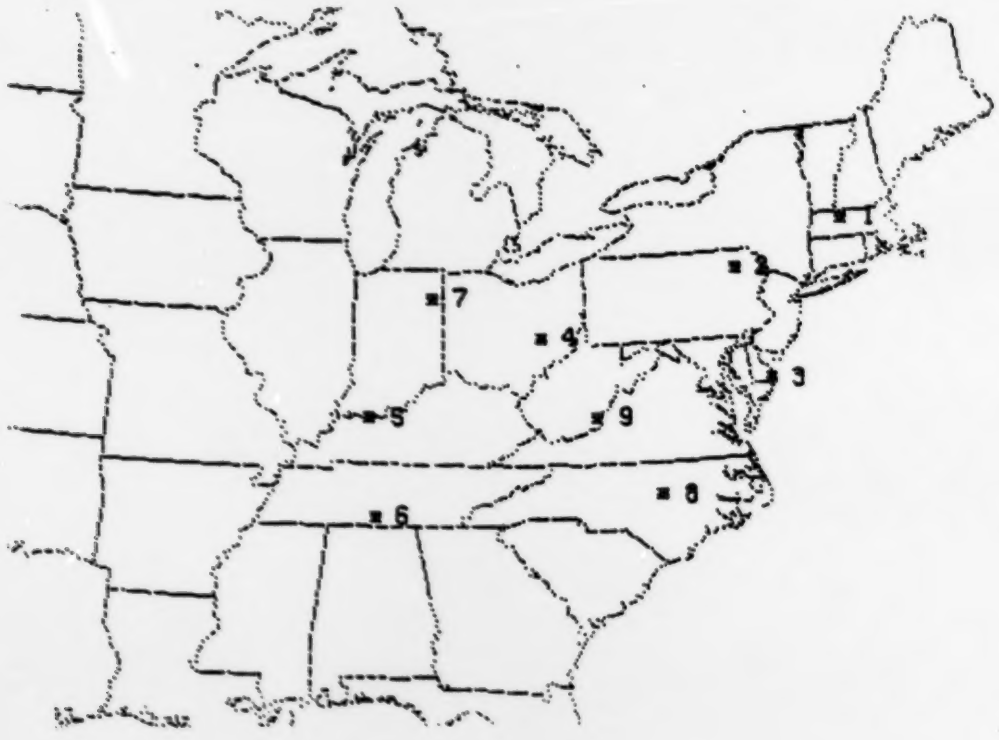


TABLE B11

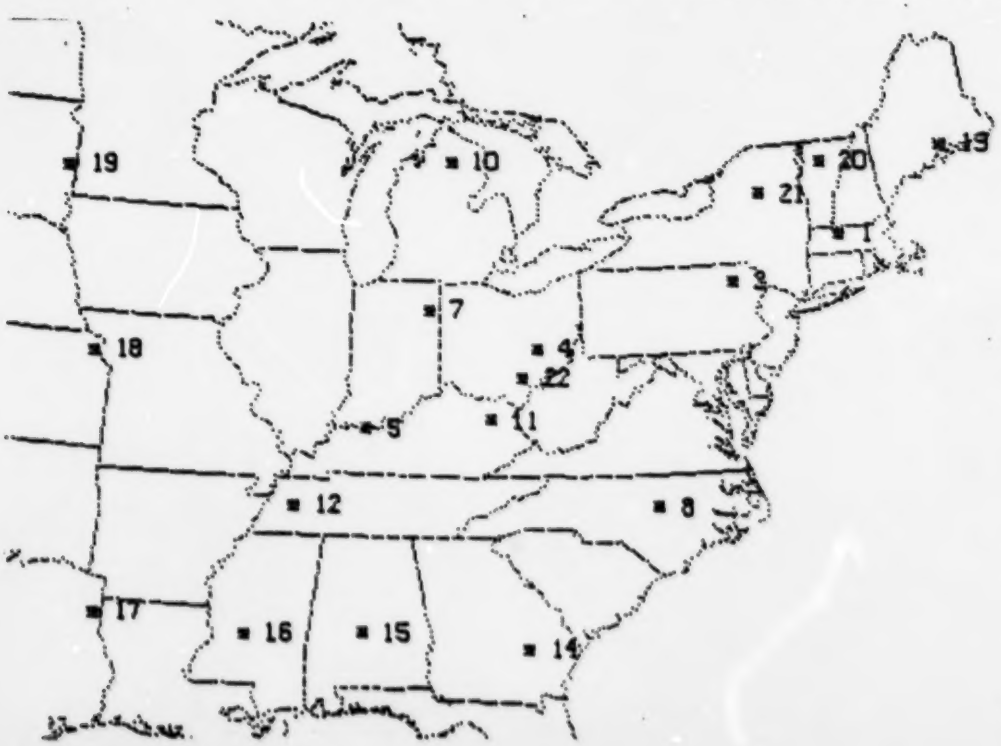
EPRI/SURE MONITORING NETWORK ANNUAL AVERAGE
CONCENTRATIONS AND DEPOSITIONS FOR 1979 TO 1981

| Map Code | Site Name | PPTN (cm) | pH | Concentrations (mg/L) | | | Depositions ($g/m^2/a$) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | $SO_4^=$ | $NO_3^-$ | $H^+$ | $SO_4^=$ | $NO_3^-$ | $H^+$ |
| | | | | 1979 | | | | | |
| 1 | Montague | 94.4 | 4.21 | 1.93 | 1.36 | 0.061 | 1.82 | 1.28 | 0.058 |
| 2 | Scranton | 83.4 | 4.13 | 2.64 | 1.64 | 0.074 | 2.20 | 1.37 | 0.062 |
| 3 | Indian River | 157.3 | 4.26 | 2.14 | 0.85 | 0.055 | 3.37 | 1.33 | 0.088 |
| 4 | Duncan Falls | 136.2 | 4.11 | 2.93 | 1.55 | 0.077 | 3.99 | 2.11 | 0.104 |
| 5 | Rockport | 146.8 | 4.23 | 2.43 | 1.14 | 0.059 | 3.56 | 1.68 | 0.088 |
| 6 | Giles County | 157.7 | 4.46 | 1.67 | 0.93 | 0.035 | 2.63 | 1.47 | 0.055 |
| 7 | Roanoke | 70.4 | 4.24 | 3.01 | 1.79 | 0.057 | 2.12 | 1.26 | 0.040 |
| 8 | Raleigh | 131.6 | 4.52 | 1.25 | 0.68 | 0.030 | 1.64 | 0.90 | 0.037 |
| 9 | Lewisburg | 76.7 | 4.43 | 1.54 | 0.85 | 0.037 | 1.18 | 0.65 | 0.029 |
| | | | | 1980 | | | | | |
| 1 | Montague | 75.3 | 4.12 | 2.41 | 1.85 | 0.066 | 1.78 | 1.39 | 0.040 |
| 2 | Scranton | 64.2 | 4.12 | 2.60 | 1.74 | 0.075 | 1.67 | 1.12 | 0.048 |
| 3 | Indian River | 56.8 | 4.24 | 2.58 | 1.15 | 0.057 | 1.47 | 0.65 | 0.032 |
| 4 | Duncan Falls | 131.7 | 4.08 | 3.26 | 1.75 | 0.082 | 4.35 | 2.33 | 0.109 |
| 5 | Rockport | 92.5 | 4.14 | 2.81 | 1.20 | 0.072 | 2.60 | 1.11 | 0.067 |
| 6 | Giles County | 89.0 | 4.46 | 1.57 | 0.92 | 0.034 | 1.40 | 0.82 | 0.031 |
| 7 | Roanoke | 88.0 | 4.20 | 2.95 | 1.94 | 0.062 | 2.59 | 1.70 | 0.055 |
| 8 | Raleigh | 94.1 | 4.27 | 1.88 | 1.12 | 0.053 | 1.77 | 1.06 | 0.050 |
| 9 | Lewisburg | 74.2 | 4.26 | 2.16 | 1.17 | 0.055 | 1.60 | 0.87 | 0.041 |
| | | | | 1981 | | | | | |
| 1 | Montague | 101.8 | 4.17 | 2.32 | 1.79 | 0.067 | 2.36 | 1.83 | 0.068 |
| 4 | Duncan Falls | 118.5 | 4.11 | 3.05 | 1.75 | 0.076 | 3.61 | 2.07 | 0.090 |
| 5 | Rockport | 93.9 | 4.09 | 3.46 | 1.49 | 0.081 | 3.25 | 1.40 | 0.076 |
| 7 | Roanoke | 99.5 | 4.20 | 3.18 | 1.95 | 0.062 | 3.16 | 1.94 | 0.062 |
| 8 | Raleigh | 81.3 | 4.37 | 1.55 | 0.85 | 0.042 | 1.26 | 0.69 | 0.034 |

FIGURE B8

Details and Locations for Utility Acid Precipitation Study Program (UAPSP) Sites

| Site No | Name | Location Longitude | Location Latitude | Elev. (m) |
|---|---|---|---|---|
| 1 | Turner Falls, MA | 72°32'55" | 42°35'50" | 98 |
| 2 | Scranton, PA | 75°59'40" | 41°34'30" | 335 |
| 4 | Zanesville, OH | 82°01'05" | 39°59'02" | 250 |
| 5 | Rockport, IN | 87°07'47" | 37°52'50" | 131 |
| 7 | Fort Wayne, IN | 85°19'08" | 41°02'39" | 244 |
| 8 | Raleigh, NC | 78°40'48" | 35°43'43" | 128 |
| 10 | Gaylord, MI | 84°38'30" | 44°56'58" | 473 |
| 11 | Clearfield, KY | 83°27'17" | 38°08'10" | 235 |
| 12 | Alamo, TN | 89°08'03" | 35°47'32" | 112 |
| 13 | Winterport, ME | 68°58'30" | 44°37'05" | 67 |
| 14 | Uvalda, GA | 82°28'25" | 32°03'18" | 64 |
| 15 | Selma, AL | 87°05'03" | 32°28'25" | 42 |
| 16 | Clinton, MS | 90°17'15" | 32°21'06" | 76 |
| 17 | Marshall, TX | 94°25'06" | 32°39'58" | 81 |
| 18 | Lancaster, KS | 95°18'17" | 39°34'10" | 346 |
| 19 | Brookings, SD | 96°49'45" | 44°19'54" | 499 |
| 20 | Underhill, VT | 72°52'08" | 44°31'42" | 442 |
| 21 | Big Moose, NY | 74°54'08" | 43°49'03" | 603 |
| 22 | McArthur, OH | 82°28'41" | 39°14'06" | 224 |






84-404

TABLE B12

UAPSP MONITORING NETWORK ANNUAL AVERAGE
CONCENTRATIONS AND DEPOSITIONS FOR 1982

| Map Code | Site Name | PPTN (cm) | pH | Concentrations (mg/L) | | | Depositions ($g/m^2/a$) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | $SO_4^=$ | $NO_3^-$ | $H^+$ | $SO_4^=$ | $NO_3^-$ | $H^+$ |
| 15 | Selma | 235.8 | 4.55 | 1.31 | 0.65 | 0.028 | 3.09 | 1.54 | 0.066 |
| 14 | Uvalda | 107.5 | 4.65 | 1.07 | 0.61 | 0.022 | 1.15 | 0.66 | 0.024 |
| 7 | Roanoke | 108.7 | 4.26 | 2.91 | 1.75 | 0.054 | 3.16 | 1.91 | 0.059 |
| 5 | Rockport | 115.2 | 4.28 | 2.75 | 1.20 | 0.052 | 3.16 | 1.38 | 0.060 |
| 18 | Lancaster | 114.5 | 4.70 | 1.56 | 1.13 | 0.020 | 1.79 | 1.30 | 0.022 |
| 11 | Clearfield | 124.0 | 4.20 | 2.42 | 1.25 | 0.062 | 3.00 | 1.55 | 0.077 |
| 13 | Winterport | 81.8 | 4.43 | 1.44 | 0.87 | 0.037 | 1.18 | 0.71 | 0.030 |
| 1 | Turner Falls | 101.8 | 4.22 | 2.23 | 1.49 | 0.060 | 2.27 | 1.51 | 0.061 |
| 10 | Gaylord | 68.6 | 4.43 | 1.79 | 1.32 | 0.037 | 1.23 | 0.91 | 0.025 |
| 16 | Clinton | 158.9 | 4.62 | 1.10 | 0.65 | 0.024 | 1.75 | 1.04 | 0.038 |
| 8 | Raleigh | 114.7 | 4.37 | 1.83 | 0.96 | 0.042 | 2.10 | 1.10 | 0.048 |
| 4 | Zanesville | 90.0 | 4.16 | 2.84 | 1.62 | 0.068 | 2.56 | 1.46 | 0.061 |
| 2 | Scranton | 75.1 | 4.17 | 2.71 | 1.67 | 0.066 | 2.03 | 1.25 | 0.050 |
| 19 | Brookings | 61.9 | 5.23 | 1.09 | 1.05 | 0.006 | 0.68 | 0.65 | 0.004 |
| 12 | Alamo | 120.7 | 4.51 | 1.61 | 0.79 | 0.031 | 1.94 | 0.95 | 0.037 |
| 17 | Marshall | 103.0 | 4.52 | 1.52 | 0.82 | 0.030 | 1.56 | 0.85 | 0.031 |
| 20 | Underhill Center | 159.7 | 4.31 | 1.83 | 1.30 | 0.049 | 2.92 | 2.07 | 0.078 |

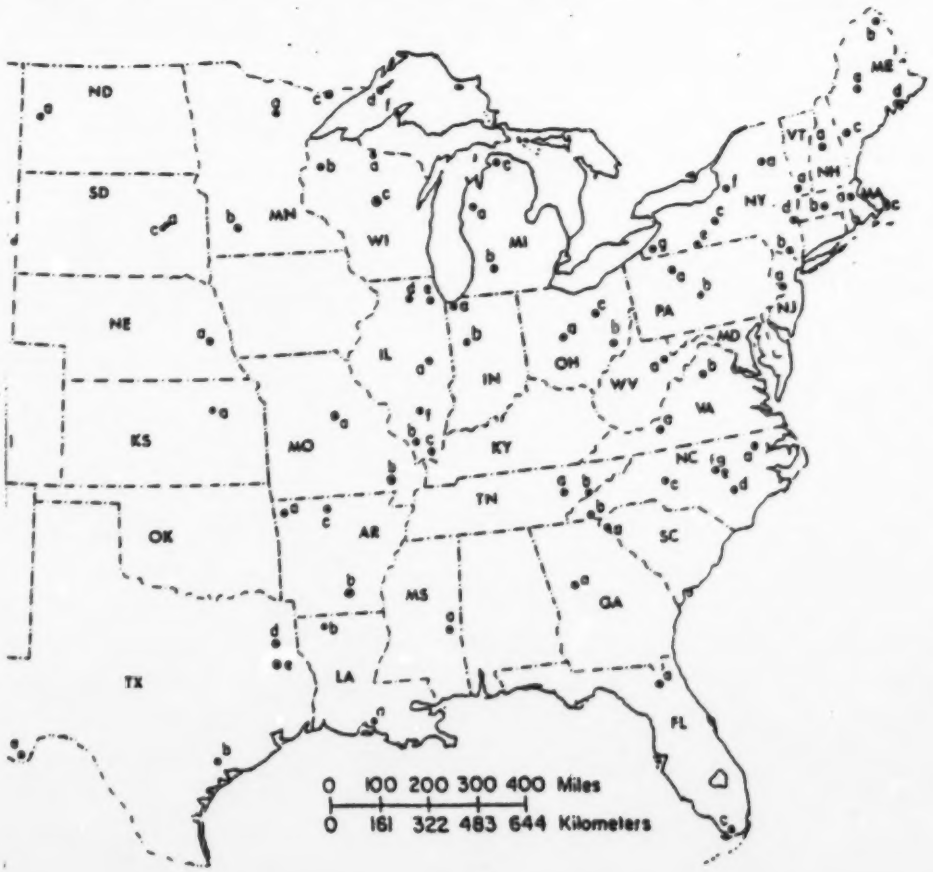
FIGURE B9

DETAILS AND LOCATIONS FOR NADP MONITORING NETWORK SITES

| Site Code | Name/State | Longitude | Latitude | Elev |
|---|---|---|---|---|
| b | Warren 2WSW; AR | 92° 06' | 33° 36' | 78 |
| c | Buffalo River; AR | 92° 35' | 36° 05' | 265 |
| a | Fayetteville; AR | 94° 10' | 36° 05' | 391 |
| a | Bradford Forest; FL | 82° 12' | 29° 58' | 44 |
| c | Everglades Nat'l Forest; FL | 80° 42' | 25° 23' | 2 |
| a | Georgia Station; GA | 84° 24' | 33° 11' | 270 |
| a | Bondville; IL | 88° 22' | 40° 03' | 212 |
| d | NIARC; IL | 88° 51' | 41° 50' | 265 |
| e | Argonne; IL | 87° 59' | 41° 42' | 229 |
| b | SIU; IL | 89° 16' | 37° 43' | 146 |
| f | Salem; IL | 88° 58' | 38° 39' | 173 |
| c | Dixon Springs Agric. Center; IL | 88° 40' | 37° 26' | 161 |
| a | IN Dunes Nat'l Lakeshore; IN | 87° 05' | 41° 38' | 208 |
| b | Purdue Univ. Ag. Farm; IN | 86° 59' | 40° 28' | 215 |
| a | Konza Prairie; KS | 96° 36' | 39° 06' | 344 |
| b | Hill Farm Research Station; LA | 93° 03' | 32° 45' | 61 |
| a | Iberia Research Station; LA | 91° 43' | 29° 56' | 6 |
| d | Acadia National Park; ME | 68° 16' | 44° 22' | 122 |
| b | Caribou; ME | 68° 01' | 46° 52' | 191 |
| c | Bridgton; ME | 70° 44' | 44° 06' | 222 |
| a | Greenville Station; ME | 69° 40' | 45° 29' | 322 |
| c | NACL; MA | 70° 01' | 41° 58' | 34 |
| b | Cadwell; MA | 72° 23' | 42° 21' | 283 |
| a | East; MA | 71° 13' | 42° 23' | 20 |
| c | Douglas Lake; MI | 84° 41' | 45° 34' | 233 |
| f | Chassell; MI | 88° 33' | 47° 06' | 279 |
| d | Isle Royale Nat'l Park; MI | 89° 09' | 47° 54' | 209 |
| b | Kellogg Biological Station; MI | 85° 23' | 42° 25' | 288 |
| a | Wellston; MI | 85° 49' | 44° 13' | 292 |
| a | Marcell Exp. Forest; MN | 93° 28' | 47° 32' | 431 |
| c | Fernberg; MN | 91° 29' | 47° 57' | 524 |
| b | Lamberton; MN | 95° 18' | 44° 14' | 343 |
| a | Meridian; MS | 88° 45' | 32° 20' | 89 |
| a | Ashland Wildlife Area; MO | 92° 12' | 38° 45' | 239 |
| b | University Forest; MO | 90° 19' | 36° 55' | 154 |
| a | Hubbard Brook; NH | 71° 42' | 43° 57' | 249 |
| a | Washington Crossing; NJ | 74° 51' | 40° 19' | 72 |
| c | Aurora Research Farm; NY | 76° 40' | 42° 44' | 249 |
| g | Chautauqua; NY | 79° 24' | 42° 18' | 488 |
| d | Knobit; NY | 73° 30' | 42° 23' | 406 |
| a | Huntington Wildlife; NY | 74° 13' | 43° 58' | 500 |
| b | Stilwell Lake; NY | 74° 02' | 41° 21' | 186 |
| f | Bennett Bridge; NY | 75° 57' | 43° 32' | 245 |
| e | Jasper; NY | 77° 32' | 42° 06' | 634 |
| a | Lewiston; NC | 77° 10' | 36° 08' | 26 |
| b | Coweeta; NC | 83° 26' | 35° 04' | 686 |
| c | Piedmont Research Station; NC | 80° 37' | 35° 42' | 221 |
| d | Clinton Crops Res. Station; NC | 78° 17' | 35° 01' | 47 |
| e | Findley (a); NC | 78° 41' | 35° 44' | 119 |
| a | Theodore Roosevelt Nat'l Park; ND | 103° 16' | 47° 36' | 618 |

FIGURE B9 (cont'd)

| Site Code | Name/State | Longitude | Latitude | Elev |
|---|---|---|---|---|
| a | Delaware; OH | 83° 04' | 40° 21' | 285 |
| b | Caldwell; OH | 81° 32' | 39° 48' | 276 |
| c | Wooster; OH | 81° 56' | 40° 47' | 315 |
| a | Kane Exp. Forest; PA | 78° 46' | 41° 36' | 618 |
| b | Leading Ridge; PA | 77° 56' | 40° 40' | 282 |
| a | Clemson; SC | 82° 50' | 34° 40' | 221 |
| c | Huron Well Field; SD | 98° 17' | 44° 22' | 390 |
| a | Walker Branch Watershed; TN | 84° 17' | 35° 58' | 341 |
| b | Elkmont; TN | 83° 35' | 35° 40' | 640 |
| a | K-Bar; TX | 103° 11' | 29° 18' | 1056 |
| d | Longview; TX | 94° 43' | 32° 23' | 107 |
| e | Forest Seed Center; TX | 94° 52' | 31° 34' | 84 |
| b | Victoria; TX | 96° 55' | 28° 51' | 31 |
| a | Bennington; VT | 73° 10' | 42° 52' | 305 |
| a | Horton's Station; VA | 80° 33' | 37° 20' | 1051 |
| b | Big Meadows; VA | 78° 26' | 38° 31' | 1047 |
| a | Parsons; WV | 79° 40' | 39° 05' | 305 |
| c | Lake Dubay; WI | 89° 39' | 44° 40' | 2113 |
| a | Trout Lake; WI | 89° 39' | 46° 03' | 501 |
| b | Spooner; WI | 91° 52' | 45° 49' | 331 |
| a | Mead; NE | 96° 30' | 41° 09' | 352 |
| f | Research Triangle Inst; NC | 78° 52' | 35° 54' | 99 |
| g | Research Triangle Park; NC | 78° 52' | 35° 54' | 94 |






84-404

TABLE B13

NADP WEEKLY MONITORING NETWORK ANNUAL
AVERAGE CONCENTRATIONS AND DEPOSITIONS FOR 1982

| Site Code | Site Name | PPTN (cm) | pH | Concentrations (mg/L) | | | Depositions ($g/m^2/a$) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | $SO_4^=$ | $NO_3^-$ | $H^+$ | $SO_4^=$ | $NO_3^-$ | $H^+$ |
| c | Bridgton, ME | 84.1 | 4.38 | 2.10 | 1.31 | 0.042 | 1.76 | 1.10 | 0.035 |
| a | Fayetteville, AR | 142.3 | 4.95 | 1.16 | 0.64 | 0.011 | 1.66 | 0.91 | 0.016 |
| a | Bradford Forest, FL | 150.4 | 4.68 | 1.26 | 0.66 | 0.021 | 1.90 | 1.00 | 0.031 |
| c | Everglades Nat'l Park, FL | 161.4 | 4.97 | 0.74 | 0.52 | 0.011 | 1.19 | 0.83 | 0.017 |
| a | Georgia Station, GA | 137.4 | 4.58 | 1.73 | 0.72 | 0.026 | 2.38 | 0.98 | 0.036 |
| e | Argonne, IL | 106.8 | 4.29 | 3.18 | 1.57 | 0.051 | 3.40 | 1.67 | 0.054 |
| a | Bondville, IL | 88.8 | 4.33 | 2.69 | 1.32 | 0.046 | 2.39 | 1.17 | 0.041 |
| c | Dixon Springs, IL | 152.7 | 4.49 | 2.28 | 1.04 | 0.032 | 3.48 | 1.59 | 0.049 |
| d | NIARC, IL | 95.4 | 4.56 | 2.50 | 1.33 | 0.028 | 2.38 | 1.27 | 0.026 |
| f | Salem, IL | 107.4 | 4.41 | 2.39 | 1.18 | 0.039 | 2.56 | 1.27 | 0.041 |
| b | SIU, IN | 130.2 | 4.46 | 2.10 | 1.02 | 0.034 | 2.73 | 1.32 | 0.044 |
| a | Indiana Dunes, IN | 108.6 | 4.35 | 2.97 | 1.66 | 0.044 | 3.22 | 1.80 | 0.048 |
| b | Caribou, ME | 94.6 | 4.66 | 1.22 | 0.70 | 0.021 | 1.16 | 0.66 | 0.020 |
| a | Greenville Station, ME | 85.6 | 4.54 | 1.58 | 0.96 | 0.029 | 1.35 | 0.82 | 0.025 |
| a | East, MA | 96.1 | 4.32 | 2.22 | 1.19 | 0.048 | 2.13 | 1.15 | 0.046 |
| c | Douglas Lake, MI | 87.5 | 4.42 | 2.31 | 1.78 | 0.038 | 2.03 | 1.55 | 0.033 |
| b | Kellogg, MI | 85.2 | 4.31 | 2.95 | 1.91 | 0.049 | 2.51 | 1.63 | 0.041 |
| c | Fernberg, MN | 79.0 | 4.96 | 1.30 | 0.86 | 0.011 | 1.03 | 0.68 | 0.009 |
| b | Lamberton, MN | 77.4 | 5.46 | 1.38 | 1.09 | 0.003 | 1.07 | 0.84 | 0.003 |
| a | Marcell, MN | 81.7 | 4.99 | 1.29 | 0.95 | 0.010 | 1.05 | 0.78 | 0.008 |
| a | Meridian, MS | 165.1 | 4.65 | 1.63 | 0.84 | 0.022 | 2.70 | 1.39 | 0.036 |
| a | Ashland, MO | 125.2 | 4.62 | 1.77 | 1.12 | 0.024 | 2.22 | 1.40 | 0.030 |
| b | University Forest, MD | 135.8 | 4.53 | 1.93 | 1.00 | 0.029 | 2.63 | 1.35 | 0.040 |
| a | Mead, NE | 95.6 | 5.23 | 1.40 | 1.14 | 0.006 | 1.34 | 1.08 | 0.006 |
| a | Hubbard Brook, NH | 101.6 | 4.33 | 1.99 | 1.55 | 0.046 | 2.02 | 1.58 | 0.047 |
| a | Washington Xing, NJ | 100.6 | 4.30 | 2.69 | 1.49 | 0.049 | 2.70 | 1.50 | 0.050 |
| a | Wellston, MI | 101.0 | 4.42 | 2.22 | 1.77 | 0.037 | 2.25 | 1.78 | 0.038 |
| a | Clemson, SC | 125.6 | 4.57 | 1.46 | 0.74 | 0.027 | 1.83 | 0.93 | 0.034 |

TABLE B13 (cont'd)

NADP WEEKLY MONITORING NETWORK ANNUAL
AVERAGE CONCENTRATIONS AND DEPOSITIONS FOR 1982

| Site Code | Site Name | PPTN (cm) | pH | Concentrations (mg/L) | | | Depositions ($g/m^2/a$) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | $SO_4^=$ | $NO_3^-$ | $H^+$ | $SO_4^=$ | $NO_3^-$ | $H^+$ |
| c | Huron, SD | 62.7 | 5.36 | 1.36 | 1.33 | 0.004 | 0.86 | 0.83 | 0.003 |
| c | Aurora, NY | 74.4 | 4.19 | 3.28 | 2.10 | 0.063 | 2.44 | 1.56 | 0.047 |
| f | Bennett Bridge, NY | 102.9 | 4.21 | 3.15 | 2.19 | 0.060 | 3.25 | 2.46 | 0.062 |
| g | Chautauqua, NY | 95.6 | 4.22 | 3.09 | 1.94 | 0.060 | 2.95 | 1.85 | 0.058 |
| a | Huntington, NY | 103.7 | 4.37 | 2.32 | 1.34 | 0.042 | 2.41 | 1.39 | 0.044 |
| e | Jasper, NY | 75.9 | 4.30 | 2.40 | 1.58 | 0.049 | 1.82 | 1.20 | 0.037 |
| d | Knobit, NY | 78.1 | 4.39 | 2.07 | 1.41 | 0.040 | 1.62 | 1.10 | 0.031 |
| b | Stilwell Lake, NY | 115.7 | 4.30 | 2.29 | 1.41 | 0.049 | 2.64 | 1.63 | 0.057 |
| d | Clinton Station, NC | 112.5 | 4.51 | 1.88 | 0.96 | 0.030 | 2.12 | 1.08 | 0.034 |
| b | Coweeta, NC | 182.5 | 4.65 | 1.29 | 0.62 | 0.022 | 2.36 | 1.13 | 0.041 |
| e | Finley (a), NC | 117.7 | 4.47 | 1.99 | 1.00 | 0.033 | 2.34 | 1.18 | 0.039 |
| a | Lewiston, NC | 116.4 | 4.49 | 1.84 | 0.97 | 0.032 | 2.14 | 1.12 | 0.037 |
| c | Piedmont Station, NC | 109.2 | 4.35 | 2.67 | 1.25 | 0.045 | 2.91 | 1.37 | 0.049 |
| f | R. Triangle Inst, NC | 139.4 | 4.44 | 2.01 | 1.02 | 0.036 | 2.80 | 1.43 | 0.050 |
| g | R. Triangle Park, NC | 149.7 | 4.39 | 1.93 | 1.08 | 0.040 | 2.90 | 1.62 | 0.060 |
| a | Teddy Roosevelt, ND | 54.2 | 5.21 | 0.99 | 0.75 | 0.006 | 0.54 | 0.41 | 0.003 |
| b | Caldwell, OH | 96.2 | 4.18 | 3.34 | 1.69 | 0.066 | 3.21 | 1.62 | 0.064 |
| a | Delaware, OH | 81.5 | 4.27 | 3.03 | 1.75 | 0.053 | 2.47 | 1.43 | 0.043 |
| c | Wooster, OH | 87.7 | 4.24 | 3.30 | 1.82 | 0.057 | 2.90 | 1.60 | 0.050 |
| a | Kane, PA | 118.2 | 4.18 | 3.18 | 1.90 | 0.065 | 3.76 | 2.25 | 0.077 |
| b | Leading Ridge, PA | 104.1 | 4.16 | 3.51 | 2.16 | 0.069 | 3.66 | 2.25 | 0.072 |
| b | Elkmont, TN | 153.5 | 4.65 | 1.41 | 0.73 | 0.022 | 2.17 | 1.13 | 0.034 |
| a | Walker Branch, TN | 145.3 | 4.33 | 2.54 | 0.97 | 0.047 | 3.69 | 1.41 | 0.068 |
| e | Forest Seed Center, TX | 127.4 | 4.85 | 1.51 | 0.77 | 0.014 | 1.93 | 0.98 | 0.018 |
| a | K-Bar, TX | 37.5 | 5.63 | 1.36 | 0.76 | 0.002 | 0.51 | 0.29 | 0.001 |
| b | Victoria, TX | 84.0 | 4.96 | 1.22 | 0.64 | 0.011 | 1.03 | 0.54 | 0.009 |
| a | Horton Station, VA | 83.1 | 4.71 | 1.50 | 0.83 | 0.019 | 1.25 | 0.69 | 0.016 |
| a | Bennington, VT | 87.0 | 4.35 | 2.31 | 1.36 | 0.044 | 2.01 | 1.18 | 0.038 |
| b | Big Meadows, VA | 122.7 | 4.43 | 2.38 | 1.15 | 0.036 | 2.92 | 1.41 | 0.045 |
| a | Parsons, WV | 151.6 | 4.31 | 2.64 | 1.30 | 0.049 | 4.01 | 1.96 | 0.074 |
| b | Spooner, WI | 84.0 | 4.92 | 1.43 | 1.15 | 0.012 | 1.20 | 0.96 | 0.010 |
| a | Trout Lake, WI | 104.3 | 4.67 | 1.86 | 1.24 | 0.021 | 1.94 | 1.29 | 0.022 |

TABLE B14

NADP WEEKLY MONITORING NETWORK ANNUAL
AVERAGE CONCENTRATIONS AND DEPOSITIONS FOR 1981

| Site Code | Site Name | PPTN (cm) | pH | Concentrations (mg/L) | | | Depositions ($g/m^2/a$) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | $SO_4^=$ | $NO_3^-$ | $H^+$ | $SO_4^=$ | $NO_3^-$ | $H^+$ |
| c | Bridgton, ME | 108.1 | 4.37 | 2.08 | 1.15 | 0.043 | 2.24 | 1.24 | 0.046 |
| a | Fayetteville, AR | 106.6 | 4.97 | 1.35 | 0.96 | 0.011 | 1.44 | 1.02 | 0.011 |
| a | Bradford Forest, FL | 89.6 | 4.71 | 1.85 | 0.82 | 0.019 | 1.66 | 0.74 | 0.017 |
| c | Everglades Nat'l Park, FL | 148.4 | 5.27 | 0.84 | 0.34 | 0.005 | 1.25 | 0.50 | 0.008 |
| a | Georgia Station, GA | 96.8 | 4.50 | 2.09 | 0.88 | 0.031 | 2.03 | 0.85 | 0.030 |
| e | Argonne, IL | 92.9 | 4.25 | 3.45 | 1.70 | 0.056 | 3.20 | 1.58 | 0.052 |
| a | Bondville, IL | 100.3 | 4.24 | 3.36 | 1.66 | 0.056 | 3.37 | 1.67 | 0.057 |
| c | Dixon Springs, IL | 113.0 | 4.34 | 2.83 | 1.23 | 0.045 | 3.19 | 1.39 | 0.051 |
| f | Salem, IL | 87.9 | 4.34 | 2.59 | 1.38 | 0.046 | 2.27 | 1.21 | 0.040 |
| b | SIU, IN | 105.3 | 4.40 | 2.68 | 1.34 | 0.039 | 2.82 | 1.41 | 0.041 |
| a | Indiana Dunes, IN | 108.6 | 4.31 | 3.52 | 1.64 | 0.048 | 3.82 | 1.78 | 0.052 |
| b | Caribou, ME | 118.5 | 4.49 | 1.94 | 0.75 | 0.032 | 2.30 | 0.89 | 0.038 |
| a | Greenville Station, ME | 113.2 | 4.59 | 1.54 | 0.80 | 0.026 | 1.74 | 0.91 | 0.029 |
| c | Douglas Lake, MI | 65.9 | 4.44 | 2.76 | 1.55 | 0.036 | 1.82 | 1.02 | 0.023 |
| b | Kellogg, MI | 83.9 | 4.33 | 3.28 | 1.83 | 0.046 | 2.75 | 1.53 | 0.038 |
| c | Fernberg, MN | 64.9 | 4.88 | 1.63 | 1.02 | 0.013 | 1.06 | 0.66 | 0.009 |
| b | Lamberton, MN | 53.5 | 5.38 | 2.02 | 1.77 | 0.004 | 1.08 | 0.95 | 0.002 |
| a | Marcell, MN | 77.7 | 5.09 | 1.30 | 1.08 | 0.008 | 1.01 | 0.84 | 0.006 |
| a | Meridian, MS | 106.2 | 4.72 | 1.50 | 0.71 | 0.019 | 1.60 | 0.75 | 0.020 |
| a | Mead, NE | 71.3 | 5.16 | 1.73 | 1.22 | 0.007 | 1.24 | 0.87 | 0.005 |
| a | Hubbard Brook, NH | 151.5 | 4.33 | 2.33 | 1.31 | 0.046 | 3.53 | 1.99 | 0.070 |
| a | Wellston, MI | 77.3 | 4.33 | 2.71 | 2.04 | 0.047 | 2.10 | 1.59 | 0.036 |
| a | Horton Station, VA | 83.0 | 4.33 | 2.60 | 1.11 | 0.046 | 2.16 | 0.92 | 0.038 |

TABLE B14 (cont'd)

NADP WEEKLY MONITORING NETWORK ANNUAL
AVERAGE CONCENTRATIONS AND DEPOSITIONS FOR 1981

| Site Code | Site Name | PPTN (cm) | pH | Concentrations (mg/L) | | | Depositions ($g/m^2/a$) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | $SO_4^=$ | $NO_3^-$ | $H^+$ | $SO_4^=$ | $NO_3^-$ | $H^+$ |
| a | K-Bar, TX | 42.5 | 5.41 | 1.08 | 0.64 | 0.004 | 0.46 | 0.27 | 0.002 |
| c | Aurora, NY | 94.9 | 4.10 | 4.01 | 2.28 | 0.078 | 3.81 | 2.17 | 0.074 |
| f | Bennett Bridge, NY | 129.2 | 4.19 | 3.31 | 2.09 | 0.064 | 4.27 | 2.70 | 0.082 |
| g | Chautauqua, NY | 102.8 | 4.17 | 3.71 | 2.10 | 0.067 | 3.81 | 2.16 | 0.069 |
| a | Huntington, NY | 102.0 | 4.33 | 2.47 | 1.60 | 0.046 | 2.52 | 1.64 | 0.047 |
| e | Jasper, NY | 72.0 | 4.28 | 2.87 | 1.56 | 0.051 | 2.07 | 1.12 | 0.037 |
| d | Knobit, NY | 96.3 | 4.24 | 2.93 | 1.80 | 0.057 | 2.82 | 1.73 | 0.055 |
| b | Stilwell Lake, NY | 117.6 | 4.21 | 2.86 | 1.72 | 0.061 | 3.36 | 2.02 | 0.072 |
| d | Clinton Station, NC | 113.0 | 4.50 | 1.81 | 0.93 | 0.031 | 2.05 | 1.05 | 0.035 |
| b | Coweeta, NC | 132.9 | 4.53 | 1.70 | 0.82 | 0.029 | 2.26 | 1.09 | 0.039 |
| e | Finley (a), NC | 76.5 | 4.54 | 1.68 | 0.99 | 0.029 | 1.29 | 0.76 | 0.022 |
| a | Lewiston, NC | 79.5 | 4.53 | 1.71 | 0.94 | 0.029 | 1.36 | 0.75 | 0.023 |
| c | Piedmont Station, NC | 99.3 | 4.31 | 2.73 | 1.30 | 0.048 | 2.71 | 1.29 | 0.048 |
| f | R. Triangle Inst, NC | 90.7 | 4.61 | 1.76 | 0.94 | 0.024 | 1.60 | 0.85 | 0.022 |
| g | R. Triangle Park, NC | 97.5 | 4.49 | 1.85 | 1.01 | 0.032 | 1.80 | 0.99 | 0.031 |
| c | Huron, SD | 40.1 | 5.37 | 1.62 | 1.59 | 0.004 | 0.65 | 0.64 | 0.002 |
| b | Caldwell, OH | 90.6 | 4.08 | 4.46 | 2.00 | 0.082 | 4.04 | 1.82 | 0.074 |
| a | Delaware, OH | 78.8 | 4.22 | 3.30 | 1.77 | 0.059 | 2.60 | 1.39 | 0.047 |
| c | Wooster, OH | 79.7 | 4.22 | 3.46 | 1.83 | 0.060 | 2.76 | 1.46 | 0.048 |
| a | Kane, PA | 131.2 | 4.21 | 2.78 | 2.10 | 0.061 | 3.65 | 2.76 | 0.080 |
| b | Leading Ridge, PA | 96.3 | 4.15 | 3.48 | 1.97 | 0.070 | 3.35 | 1.90 | 0.068 |
| b | Elkmont, TN | 142.2 | 4.43 | 2.13 | 0.95 | 0.036 | 3.03 | 1.36 | 0.052 |
| a | Walker Branch, TN | 95.3 | 4.27 | 2.98 | 1.21 | 0.053 | 2.84 | 1.16 | 0.051 |
| b | Victoria, TX | 113.6 | 4.95 | 1.03 | 0.66 | 0.011 | 1.17 | 0.75 | 0.013 |
| a | Parsons, WV | 129.4 | 4.17 | 3.54 | 1.89 | 0.067 | 4.58 | 2.44 | 0.086 |
| b | Spooner, WI | 75.9 | 4.80 | 2.28 | 1.43 | 0.016 | 1.73 | 1.08 | 0.012 |
| a | Trout Lake, WI | 72.6 | 4.70 | 1.78 | 1.23 | 0.020 | 1.30 | 0.89 | 0.014 |

TABLE B15

NADP WEEKLY MONITORING NETWORK ANNUAL
AVERAGE CONCENTRATIONS AND DEPOSITIONS FOR 1980

| Site Code | Site Name | PPTN (cm) | pH | Concentrations (mg/L) | | | Depositions ($g/m^2/a$) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | $SO_4^=$ | $NO_3^-$ | $H^+$ | $SO_4^=$ | $NO_3^-$ | $H^+$ |
| a | Bondville, IL | 75.3 | 4.17 | 3.70 | 2.15 | 0.067 | 2.78 | 1.62 | 0.050 |
| c | Dixon Springs, IL | 84.6 | 4.25 | 3.28 | 1.58 | 0.056 | 2.78 | 1.34 | 0.048 |
| a | Greenville Station, ME | 78.3 | 4.39 | 2.11 | 1.18 | 0.040 | 1.65 | 0.92 | 0.031 |
| c | Douglas Lake, MI | 47.2 | 4.31 | 3.03 | 2.08 | 0.048 | 1.43 | 0.98 | 0.023 |
| b | Kellogg, MI | 79.8 | 4.31 | 3.66 | 2.28 | 0.049 | 2.91 | 1.82 | 0.039 |
| a | Wellston, MI | 83.1 | 4.34 | 2.80 | 2.03 | 0.045 | 2.32 | 1.69 | 0.038 |
| a | Marcell, MN | 59.7 | 5.06 | 1.33 | 1.28 | 0.009 | 0.80 | 0.76 | 0.005 |
| a | Hubbard Brook, NH | 86.8 | 4.26 | 2.46 | 1.83 | 0.055 | 2.14 | 1.59 | 0.047 |
| c | Aurora, NY | 79.6 | 4.10 | 3.91 | 2.46 | 0.078 | 3.11 | 1.96 | 0.062 |
| d | Knobit, NY | 64.8 | 4.22 | 2.91 | 1.88 | 0.060 | 2.03 | 1.32 | 0.039 |
| b | Stilwell Lake, NY | 102.5 | 4.21 | 2.81 | 1.66 | 0.062 | 2.88 | 1.71 | 0.063 |
| e | Jasper, NY | 61.1 | 4.22 | 2.72 | 1.77 | 0.059 | 1.66 | 1.08 | 0.036 |
| a | Lewiston, NC | 87.3 | 4.44 | 2.25 | 1.28 | 0.036 | 1.96 | 1.12 | 0.031 |
| b | Coweeta, NC | 157.5 | 4.47 | 1.73 | 0.84 | 0.033 | 2.73 | 1.32 | 0.052 |
| c | Piedmont Station, NC | 99.9 | 4.28 | 3.02 | 1.43 | 0.051 | 3.02 | 1.43 | 0.051 |
| d | Clinton Station, NC | 116.5 | 4.50 | 1.85 | 0.99 | 0.031 | 2.15 | 1.15 | 0.036 |
| e | Finley (a), NC | 87.2 | 4.39 | 2.26 | 1.22 | 0.040 | 1.97 | 1.07 | 0.035 |
| a | Delaware, OH | 108.6 | 4.10 | 3.98 | 2.21 | 0.078 | 4.32 | 2.40 | 0.085 |
| b | Caldwell, OH | 97.4 | 4.06 | 4.14 | 2.02 | 0.086 | 4.04 | 1.96 | 0.083 |
| c | Wooster, OH | 90.6 | 4.15 | 3.64 | 1.86 | 0.069 | 3.30 | 1.69 | 0.063 |
| a | Kane, PA | 103.7 | 4.13 | 3.45 | 2.00 | 0.073 | 3.58 | 2.07 | 0.075 |
| b | Leading Ridge, PA | 92.5 | 4.13 | 3.39 | 2.06 | 0.073 | 3.13 | 1.90 | 0.068 |
| a | Clemson, SC | 123.3 | 4.43 | 1.93 | 0.96 | 0.037 | 2.38 | 1.19 | 0.046 |
| a | Parsons, WV | 122.3 | 4.16 | 3.56 | 2.03 | 0.069 | 4.36 | 2.49 | 0.084 |
| a | Trout Lake, WI | 73.5 | 4.64 | 1.80 | 1.55 | 0.023 | 1.32 | 1.14 | 0.017 |
| a | Huntington, NY | 72.3 | 4.22 | 2.79 | 1.92 | 0.060 | 2.01 | 1.39 | 0.043 |

# APPENDIX C

## AIR MONITORING RESULTS, 1979 to 1982

TABLE C1

AES-APN Air Monitoring Network Annual Average Concentrations for 1979 to 1982

| Site Name | Annual Average Concentrations ($\mu g/m^3$) $SO_4^=$ | $NO_3^-$ | $SO_2$ |
|---|---|---|---|
| Year: 1982 | | | |
| ELA-Kenora | 1.25 | 0.55 | 1.9 |
| Algoma | 2.83 | 0.88 | 3.2 |
| Chalk River | 2.73 | 0.75 | 8.6 |
| Long Point | 3.00 | 1.65 | 16.9 |
| Montmorency | 1.50 | 0.38 | 2.6 |
| Kejimkujik | 2.26 | 0.52 | 2.4 |
| Year: 1981 | | | |
| ELA-Kenora | 1.34 | 0.62 | n/a |
| Algoma | 2.38 | 0.80 | 3.6 |
| Chalk River | 1.29 | 0.46 | 8.5 |
| Long Point | 4.94 | 3.08 | 16.5 |
| Year: 1980 | | | |
| ELA-Kenora | 1.14 | 0.44 | 1.6 |
| Chalk River | 2.27 | 0.71 | 8.3 |
| Long Point | 4.48 | 3.54 | 16.4 |
| Year: 1979 | | | |
| ELA-Kenora | 1.62 | 0.63 | 1.5 |
| Chalk River | 3.81 | 0.92 | 9.3 |
| Long Point | 8.10 | 4.36 | 16.0 |
| Toronto (CN Tower) | 6.68 | 3.13 | 33.5 |

TABLE C2

OME-APIOS Air Monitoring Network Annual Average Concentrations for 1981 and 1982

| Map No. | Site Name | Annual Average Air Concentrations ($\mu g/m^3$) $SO_4^=$ | $NO_3^-$ | $HNO_3$ | $T_{NO_3^-}$ | $SO_2$ |
|---|---|---|---|---|---|---|
| Year: 1982 | | | | | | |
| 2 | Longwoods | 5.34 | 1.80 | 3.00 | 4.80 | 10.7 |
| 8 | Dorset | 3.37 | 0.24 | 1.45 | 1.69 | 4.9 |
| 11 | Charleston Lake | 3.69 | 0.84 | 1.82 | 2.66 | 6.3 |
| 16 | Fernberg | 1.54 | 0.22 | 0.56 | 0.78 | 1.5 |
| Year: 1981 | | | | | | |
| 2 | Longwoods | 5.16 | 1.99 | 1.95 | 3.94 | 7.1 |
| 8 | Dorset | 3.39 | 0.27 | 1.37 | 1.64 | 5.0 |
| 11 | Charleston Lake | 3.71 | 0.58 | 1.73 | 2.30 | 4.0 |

TABLE C3

Ontario Hydro Air Monitoring Network Annual Average Concentrations for 1980 to 1982

| Map No. | Site Name | Annual Average Air Concentrations ($\mu g/m^3$) $SO_4^=$ | $NO_3^-$ | $HNO_3$ | $T_{NO_3^-}$ | $SO_2$ |
|---|---|---|---|---|---|---|
| Year: 1982 | | | | | | |
| 3 | Dorset | 3.20 | 0.19 | 0.40 | 0.59 | 2.8 |
| 4 | Vankleek Hill | 3.41 | 0.39 | 1.36 | 1.75 | 4.0 |
| 7 | Mississagi | 2.63 | 0.15 | 0.35 | 0.50 | 1.9 |
| 8 | Kapuskasing | 1.64 | 0.17 | 0.15 | 0.32 | 2.7 |
| Year: 1981 | | | | | | |
| 3 | Dorset | 4.18 | 0.19 | 0.55 | 0.74 | 3.7 |
| 4 | Vankleek Hill | 7.94 | 0.75 | 1.08 | 1.83 | 5.4 |
| Year: 1980 | | | | | | |
| 3 | Muskoka (Dorset) | 4.3 | | | 1.34 | |
| 4 | Vankleek Hill | 6.0 | | | 3.44 | |
| 1 | Essex | 9.4 | | | 5.44 | |
| 6 | Toronto | 6.0 | | | 2.93 | |
| 9 | Peacock Point | 5.9 | | | 2.49 | |